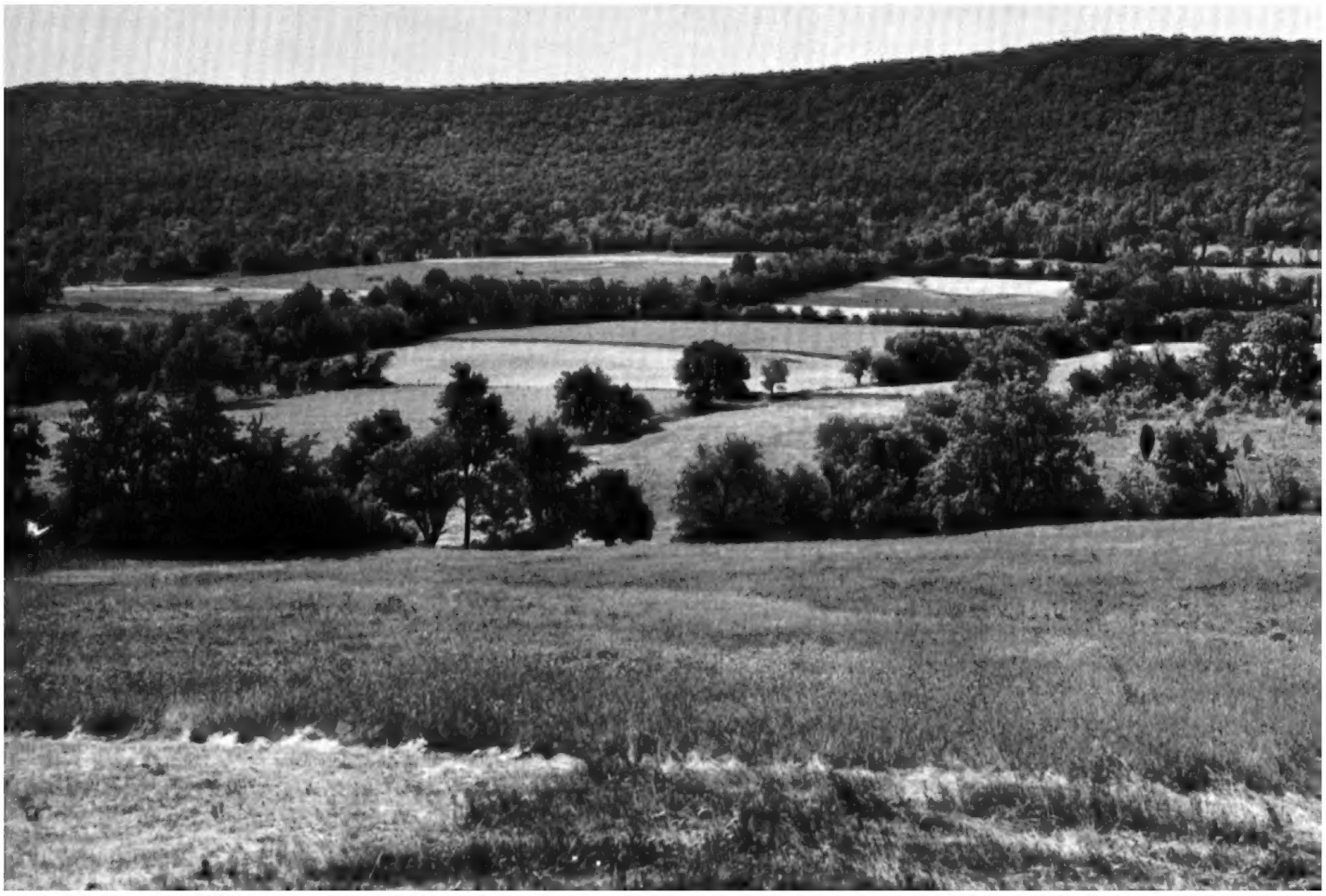
SOIL SURVEY
CLINTON COUNTY
Pennsylvania



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
THE PENNSYLVANIA STATE UNIVERSITY
College of Agriculture and Agricultural Experiment Station
and the
PENNSYLVANIA DEPARTMENT OF AGRICULTURE
State Soil and Water Conservation Commission

HOW TO USE THIS SOIL SURVEY REPORT

Major fieldwork for this soil survey was done in the period 1947–61. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1961. This survey was made cooperatively by the Soil Conservation Service and the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and Pennsylvania Department of Agriculture, State Soil and Water Conservation Commission. It is part of the technical assistance furnished to the Clinton County Soil and Water Conservation District.

THIS SOIL SURVEY of Clinton County, Pa., contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Identifying the Soils

All the soils of Clinton County are shown on the detailed map at the back of this report. This map has many sheets made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets. This index helps to locate an area quickly on the detailed map.

On each sheet of the detailed map, soil boundaries are outlined and are identified by a symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Recording Information

Use the "Guide to Mapping Units" to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each soil is described, and also the page for the capability unit and woodland group.

What is learned about a farm or other tract can be recorded conveniently by listing from the soil map the symbols shown for the tract, and then referring to the "Guide" for the names of the soils and the groups in which each soil has been placed. Colored sketch maps can be prepared to record decisions made from studying the report. Trace the boundaries of the soils on translucent paper or plastic laid over the detailed soil map. Then color the soil areas to show their degree of limitation when used for crops, pasture, trees, septic tanks, parks, playgrounds, or many other purposes. Green, for example, can indicate soils with *slight* limitations; yellow, *moderate;* and red, *severe.*

Foresters and others interested in woodland can refer to the subsection "Woodland Uses of the Soils." In that subsection the soils of the county are placed in groups according to their suitability for trees, and management of each group is discussed.

Game managers, sportsmen, and others concerned with wildlife will find information about the main kinds of wildlife and their food and cover in the section "Soils and Wildlife."

Engineers and builders will find in the section "Engineering Uses of the Soils" tables that give engineering descriptions of the soils in the county; that name soil features that affect engineering practices and structures; and that rate the soils according to their suitability for several kinds of work.

Scientists and others who are interested can read about how the soils were formed and how they are classified in the section "Formation, Morphology, and Classification of Soils."

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest.

Newcomers in Clinton County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

Cover Picture: **Typical landscape in east end of Nittany Valley, which is in the Ridge and Valley province of the county. Hagerstown soils are in the foreground, Murrill soils are in the central part, Laidig soils are on the foot slopes of the ridge, and Dekalb soils are on the forested ridge.**

U.S. GOVERNMENT PRINTING OFFICE: 1966

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Contents

NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued August 1966

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF CLINTON COUNTY, PENNSYLVANIA

BY WALTER J. STEPUTIS, RALPH E. MATTICKS, ROBERT ZIMMERMAN, AND ROBERT HENRY, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE AND AGRICULTURAL EXPERIMENT STATION, AND PENNSYLVANIA DEPARTMENT OF AGRICULTURE, STATE SOIL AND WATER CONSERVATION COMMISSION

CLINTON COUNTY is in the north-central part of Pennsylvania (fig. 1). It was formed in 1839 from

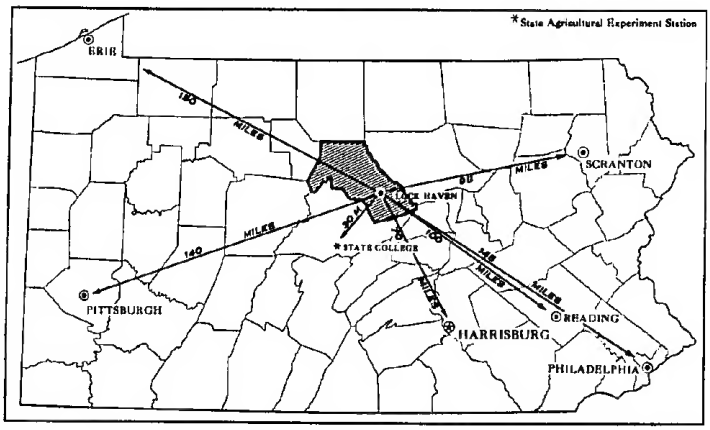

Figure 1.—**Location of Clinton County in Pennsylvania.**

land then in Centre and Lycoming Counties. The land area consists of 577,280 acres, or 902 square miles. Lock Haven, the county seat, is in the lower central part of the county where the West Branch of the Susquehanna River turns toward the east. The northern two-thirds of the county is in the Allegheny Plateau province, and the rest of the county is in the Ridge and Valley province.

Iroquois Indians controlled the area when settlement of Clinton County began some time before 1775. The pioneers occupied choice plots of land and gradually forced the Indians westward, and from about 1783 settlement and development have been uninterrupted.

Coal mining and the manufacturing of iron occupied the early settlers. These were replaced by lumbering. Today, manufacturing and farming are the main occupations.

In 1960, according to the U.S. Census, the population of Clinton County was 37,619. Lock Haven had a population of 11,748, and Renovo, the second largest community, had a population of 3,316.. Many smaller communities are scattered throughout the county.

Most farming in Clinton County is done in the limestone valleys and in the valley of the West Branch of the Susquehanna River. The soils in the limestone valleys are fine textured and are highly productive. They are used principally for dairying. Most of the soils in the river valley are used for specialized crops. About three-fourths of the land area in the county, however, consists of steeper, less productive, acid soils formed from sandstone and shale in both the Allegheny Plateau section and the Ridge and Valley province. Much of this acreage is wooded.

All farms in the county have access to main roads that lead to markets. U.S. Route 220 crosses the county northeast to southwest from Avis to Beech Creek. Interstate Route 80, a divided highway, provides rapid transit across the southern part of the county. The northern part of the county is served by U.S. Route 120, which extends from Lock Haven to Renovo and to Westport and beyond. Pennsylvania Route 64 extends from Lock Haven to Lamar and points west. Loganton, to the south, is served by Pennsylvania Route 880, which extends from Lock Haven southward. Nittany Valley, Sugar Valley, and Nippenose Valley have secondary macadam roads. Such unpaved roads as township roads, forestry roads, and lumbering roads serve the mountainous woodland. They are kept in good condition for most of the year so that the forested areas are generally accessible.

Two major railroads serve Clinton County. A main line of the Pennsylvania Railroad, from Buffalo to Philadelphia, connects Lock Haven and Renovo and carries large amounts of freight. The New York Central line extends from east to west in the county and serves communities in Bald Eagle Valley. In addition, there is an airport on the flood plain of the West Branch of the Susquehanna River east of Lock Haven.

How This Soil Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Clinton County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rocks; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent

material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in other counties nearby and in places more distant. They classified and named the soils according to nationwide uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important distinguishing characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Dekalb and Hagerstown, for example, are the names of two series represented in Clinton County. All the soils in the United States that have the same series name are essentially alike in those characteristics that go with their behavior in the natural landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soils series contain soils that differ in the texture of their surface layer. According to such differences in texture, soil types are defined. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Huntington fine sandy loam and Huntington silt loam are two soil types in the Huntington series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Dekalb channery loam, 0 to 3 percent slopes, is one of several phases of Dekalb channery loam, a soil type that ranges from nearly level to steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs. The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed and so small in size, that it it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soils in it, for example, Berks-Montevallo channery silt loams. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind, water, or man that they scarcely can be called soils. These areas are shown on a soil map, like other mapping units, but they are given descriptive names, such as Made land or Riverwash and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. Based on the yields, conservation practices needed, and other data, the soil scientists set up trial management groups, and test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Clinton County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The soil associations in Clinton County are discussed in the pages that follow. More detailed information about the soils is given in the section "Descriptions of the Soils."

1. Dekalb-Hartsells-Cookport Association

Moderately deep and deep soils underlain by sandstone; on ridgetops and slopes

The main soils of this association are on ridgetops and slopes, in the Allegheny Plateau in the northern part of the county, and in the Ridge and Valley province in the

southern part. Broad ridges and gentle slopes are characteristic of the Allegheny Plateau. In contrast, the Ridge and Valley province has narrower ridges and small plateaus. In general, the landscape in this association is a gently sloping plain that includes a few low hills. The West Branch of the Susquehanna River, which curves through the area from Lock Haven northwestward toward Clearfield, has cut narrow, steep-walled valleys through the Allegheny Plateau section. In the Ridge and Valley province, the plateaus are much less dissected.

The Dekalb, Hartsells, and Cookport soils are nearly level to steep. Dekalb soils are moderately deep, sandy, and mostly stony. The steep Dekalb soils are the principal soils on the walls of valleys in the association. Near the Dekalb soils are the Hartsells soils, which are deep and well drained, and the Cookport soils, which are deep and somewhat poorly drained. Hartsells soils occupy small areas within larger areas of Cookport and Dekalb soils.

Minor soils in this association are those of the Nolo, Lickdale, Leetonia, Gilpin, and Cavode series. The poorly drained Nolo soils and the very poorly drained Lickdale are wet and are shallow over a hard, brittle subsoil. Leetonia soils are highly leached, stony, and very sandy. They are mainly in the central and northwestern parts of the Allegheny Plateau section, chiefly north of Bald Eagle Creek and in the northwestern part of the county north of Hammersley Fork. The Gilpin soils are moderately deep, well drained, and shaly, and the Cavode are deep, somewhat poorly drained, heavy, and clayey. Areas of these soils are small and are intermixed with other soils of this association, but in many places they are near outcrops of coal from the Allegheny formation.

Other minor soils are those of the Ungers, Albrights, and Upshur series. These soils are red and occupy a few small areas throughout the association.

Most of this soil association is forested. Large tracts are in State Forests and State Game Lands. Smaller acreages are owned by private individuals or by companies that process woodpulp. Some lumbering is done, but most of the trees are harvested for woodpulp. Only a few semiportable sawmills remain of the many large ones that once operated in the county. Many roads provide access to the forest, and hunting camps and summer homes are numerous. Although a few areas were once cleared and farmed, most of these are now used for summer homes or hunting camps, and the areas are now reforested. In areas underlain by the Allegheny formation, where the seams of coal are thick enough and extensive enough to warrant mining, coal has been removed by strip mining. Areas that have been strip mined are mainly in the townships of West Keating and East Keating in the western part of the county.

2. Dekalb-Lehew Association

Steep, moderately deep, stony soils on mountains and ridges

The main soils of this association are on steep slopes that border the Susquehanna River and its tributaries in the Allegheny Plateau part of the county or are on mountainsides that border limestone valleys and major streams in the Ridge and Valley province in the southern part. The Dekalb and Lehew soils are somewhat similar, are 18 to 30 inches deep, and in many places are closely associated. The Dekalb are the most extensive. They are moderately deep, well drained, yellowish, and sandy. Most are very stony. Lehew soils are moderately deep, well drained, reddish, sandy, and very stony.

Minor areas of Stony land and Rubble land are also in this association. Stony land is shallow in many places. The soil material has many boulders of sandstone or quartzite on the surface and throughout. It is droughty and low in fertility. Rubble land has little soil material, and boulders cover 90 percent or more of the surface. A typical area of Rubble land is near the summit of Bald Eagle Mountain about a mile east of Lock Haven.

Much of Clinton County that is visible from the main roads and towns is in this association. A large proportion of the forests in the county are on the Dekalb soils of this association. Trees reach merchantable size on the Dekalb and Lehew soils in a moderate length of time. They grow very slowly on Stony land, and areas of Rubble land generally have few trees or shrubs on them.

3. Cavode-Leadvale-Gilpin Association

Moderately deep and deep, brown, nearly level, shaly soils

The main soils of this association are in the western and central parts of the county in the Allegheny Plateau section, but small areas are scattered throughout the county. The Cavode and Gilpin soils occupy similar positions in the uplands. The Cavode soils are nearly level to gently sloping, and the Gilpin are nearly level to moderately sloping. Leadvale soils are at the base of slopes in the uplands, in concave areas on lower slopes, or along small streams.

Cavode soils are moderately deep to deep, somewhat poorly drained, brownish, and clayey. Gilpin soils are moderately deep, well drained, brownish and shaly. In places they are underlain by coal, and some areas have spoil from strip mining on them. Leadvale soils are deep, moderately well drained, brownish, and clayey.

Minor soils of this association are the well-drained Hartsells and Dekalb soils, the moderately well drained Cookport soils, and the poorly drained Nolo soils.

Most of this association is wooded. Some areas were farmed in the past, but poor yields and lack of markets caused the farms to be abandoned. Such areas are now reverting to woodland. Some areas have been strip mined, but these are mostly in the western part of the association.

4. Leck Kill-Meckesville-Klinesville Association

Shallow to deep, red, shaly soils

The main soils of this association are in a narrow area about a half mile wide. The area extends from Pine Creek in the eastern part of the county to Beech Creek in the western part at the base of outcrops of the Catskill formation. The soils are shallow to deep and are red and shaly.

Predominant in this association are well-drained, reddish soils. Of these, the Leck Kill soils are moderately deep. The Meckesville are deep and have a firm layer at a depth of 30 to 36 inches. Klinesville soils are shallow and have many fragments of shale and sandstone on the surface.

Minor soils of this association are the nearby Albrights soils. These are deep, reddish soils that are moderately well drained to somewhat poorly drained.

The soils of this association are well suited to crops and are therefore desirable as farmsteads. They are easy to till, warm early in spring, and are moderate to moderately high in productivity. They are susceptible to erosion, however, and require protection from runoff. Sheet erosion is moderate to severe in areas that are cleared.

Most areas of this association are in farms. Small, steep and stony areas are in second-growth woodland.

5. Hagerstown-Wiltshire Association

Deep, well drained and moderately well drained soils on limestone in valleys

The main soils of this association are in the Nippenose, Nittany, and Sugar Valleys, which are the major limestone valleys in the county. These are deep soils that formed in impurities from the hard, gray limestone, which underlies the valleys. The Hagerstown are well-drained, heavy soils and have a reddish to yellowish subsoil. Wiltshire soils are moderately well drained. They are in depressions and in other areas where soil and water accumulates and have a mottled layer at a depth of 24 to 36 inches. A typical landscape of this association is shown in figure 2.

Minor soils of this association are those of the Morrison series and the local alluvium phases of the Huntington series. The Morrison soils, formed in material from calcareous sandstone, are deep, well drained, and sandy. They are on Sand Ridge, which extends from Centre County into Clinton County in a broad wedge about one-half mile long. The Huntington soils, on small alluvial fans, formed in fine silt and clay washed from the Hagerstown soils. These soils are deep and are well drained.

Drainage is mostly underground through caverns and solution channels in the limestone. Occasionally during dry weather the major streams disappear into the ground. Sinkholes are common. Wells drilled into the limestone for drinking water frequently are contaminated.

The soils of this association are productive, and much of the area is in farms. Dairying is the main kind of farming. The areas in woodland are small.

6. Berks-Hartleton-Allenwood Association

Shallow to deep soils on shale in glaciated valleys

The landscape in this association is characterized by very steep hills and narrow valleys. The soils are in an area about 2½ miles wide that extends from Pine Creek in the eastern part of the county to Beech Creek in the western part. These soils are shallow to deep and are well drained. They formed mainly in material from shale that was mixed somewhat by glaciers in ancient time.

Figure 2.—**Typical landscape of an area in association 5. Hagerstown silt loam is on the valley floors and ridges, and soils of the Dekalb series are in the background.**

The Berks soils occupy much of this association. These are moderately deep to shallow, moderate to steep soils on slopes of narrow V-shaped valleys. The Hartleton soils are moderately deep, brownish soils derived from acid shale. They are nearly level to moderately sloping. Allenwood soils are deep, are nearly level to moderately steep, and have a yellowish-red subsoil. They formed in material mainly from shale but partly from sandstone and quartzite.

Minor soils of this association are those of the Comly, Watson, and Montevallo, and Brinkerton series. The moderately well drained to somewhat poorly drained Comly soils are gently sloping. They are in depressions and on benches. The moderately well drained Watson soils and the poorly drained Brinkerton soils are in drainageways, swales, and depressions and make up the smallest part of the association. The very shallow Montevallo soils are in small areas on steep slopes associated with the Berks soils.

Only a moderate acreage of this association is in farms. The farms are made up of the more level and moderately sloping soils. These soils are easy to till, but they are droughty and are moderately eroded to severely eroded. Productivity is low, and crop failures are common.

7. Murrill-Buchanan-Laidig Association

Deep soils on limestone in valleys at the base of mountains

The main soils of this association are in an area about one-half mile wide that extends from the base of steep mountain slopes outward into valleys underlain by limestone. These soils are deep. They formed in materials that were moved downslope by gravity, water, and ice onto lower lying areas. A typical view of this association is shown in figure 3.

The largest acreage in this association is occupied by the Murrill soils. These soils are well drained. They formed in a mixture of material from sandstone and shale that overlies material from limestone. Of the other major soils, the Buchanan are moderately well drained to somewhat poorly drained. The well-drained Laidig soils, also major soils, formed in colluvium, mainly from sandstone. They are mostly at the eastern end of Sugar Valley, but small areas are scattered along foot slopes of mountains in other valleys in the association. Generally, Laidig soils have a sandy surface layer and are stony.

Minor soils of this association are those of the Andover series. These soils are moderately deep to shallow over a fragipan. They are poorly drained.

Figure 3.—Typical landscape of an area in association 7 in the eastern part of Nittany Valley. In the foreground are sloping to moderately sloping Murrill and Buchanan soils of the association. Dekalb soils are on the forested ridges in the background.

Except for the stony Laidig soils and the Andover soils, much of this association is farmed. Dairying is dominant. The Murrill soils are used for crops and for pasture. The Laidig, Buchanan, and Andover soils are used mainly for pasture and hay. Yields of crops are moderate.

8. Lehew-Ungers-Albrights Association

Moderately deep or deep, reddish soils underlain by sandstone and shale

The main soils of this association are moderately deep or deep and are reddish in color. The Lehew soils occupy moderately steep to steep areas, and the Ungers and Albrights soils are in nearly level to moderately sloping areas. The largest area of this association is near Tamarack, but small areas are scattered throughout the Allegheny Plateau. Another small area is in the southern part of the county.

Lehew soils are moderately deep, well drained, sandy, and stony. They are mostly in woodland. The Ungers soils are deep, well drained, and sandy. These soils are easy to work. Crops on them make moderate to high yields, and most areas are in crops. Albrights soils are deep and clayey and are moderately well drained to somewhat poorly drained. They are closely associated with the Ungers soils.

Minor soils of this association are those of the Lickdale, Dekalb, and Hartsells series. The Lickdale soils are in swampy areas like those at Tamarack. The Dekalb and Hartsells soils occupy small areas within the association.

Farms are scattered throughout this association. They are mostly on the Ungers soils, which are moderately good for farming.

9. Ashton-Huntington Association

Soils on flood plains and terraces in materials washed from soils underlain by limestone

This soil association consists mainly of Ashton and Huntington soils on flood plains and terraces in the southern part of the county. These soils are deep and are well drained. The Ashton soils, along the Susquehanna River, occupy areas from Lock Haven eastward (fig. 4.). They are flooded occasionally when Bald Eagle Creek overflows. Huntington soils are on flood plains of streams, which drain areas that are highly calcareous.

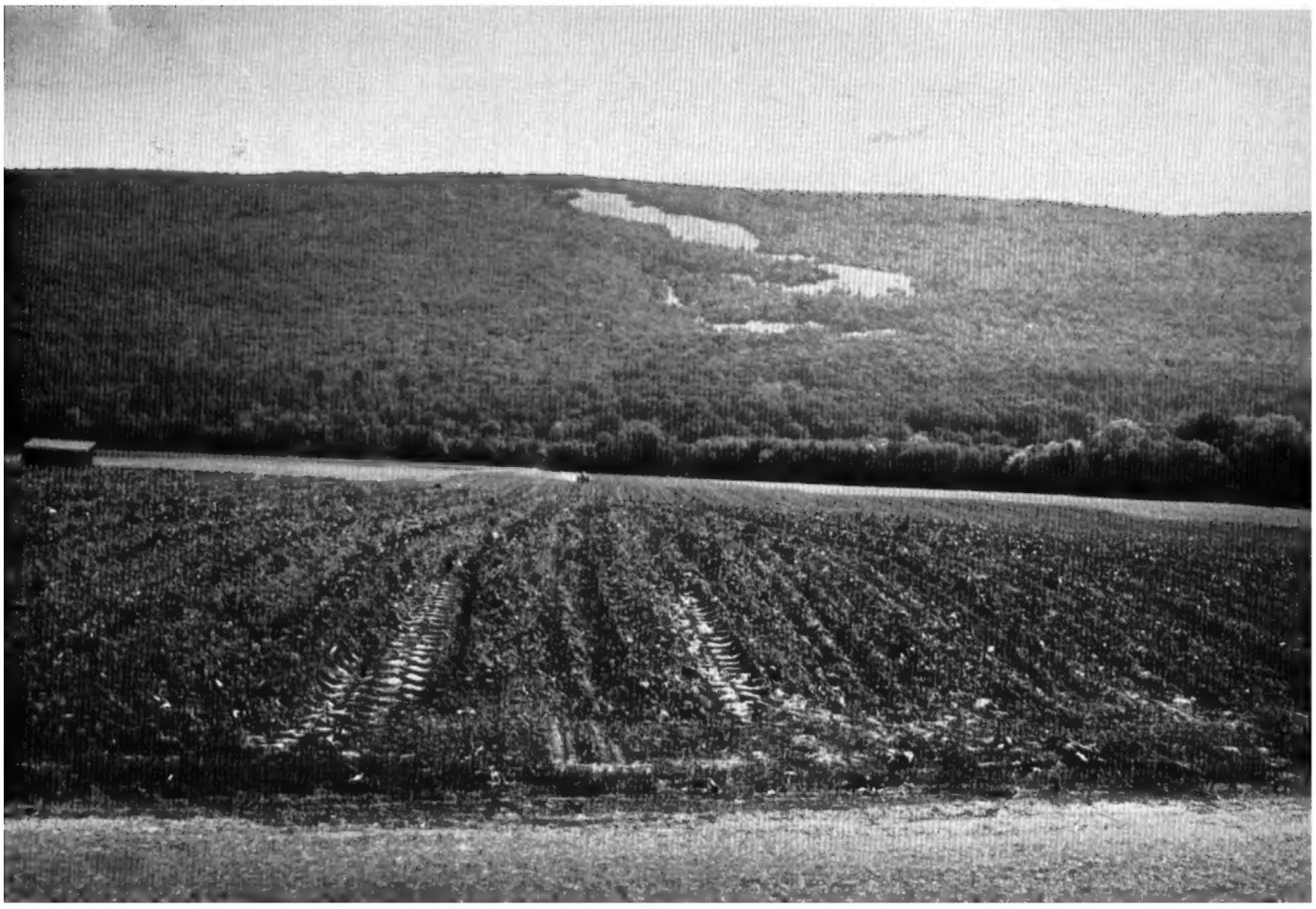

***Figure 4.*—Typical landscape of association 9, showing Ashton silt loam along the West Branch of the Susquehanna River, below Lock Haven. In the background on the side of the mountain is Rubble land surrounded by areas of Dekalb soils.**

The moderately well drained Lindside soils, the somewhat poorly drained Newark, and the poorly drained Melvin occupy minor areas of this association. These soils are closely associated with the Huntington soils, and all of them are flooded more frequently than the Ashton soils. Nevertheless, they are highly desirable for crops.

Most of this association is in crops, and yields are high. Tobacco, corn, wheat, and alfalfa grown for hay are the main crops, but potatoes and other vegetables are also grown on the Ashton soils.

10. Pope-Barbour-Sequatchie Association

Soils along streams; from acid materials

The soils of this association are on nearly level, gently sloping, and gently undulating terraces and flood plains along streams that drain uplands underlain by acid sandstone and shale. They are mostly in the northern part of the county, but small areas are also in other parts of the county.

Pope soils, on alluvial fans at the mouth of small streams, are deep and well drained and are gravelly and cobbly. They are moderate in fertility. Flooding is not a problem. Representative areas of these soils are the deltaic fans built by Antes Creek in Nippenose Valley and by Chatham Run at Woolrich.

Barbour soils are along Kettle Creek and Young Womans Creek. These are deep, well-drained, reddish soils that are sandy and loamy. They are closely associated with the moderately well drained to somewhat poorly drained Basher soils and the poorly drained Atkins soils. All of these soils are flooded periodically; nevertheless, much of the acreage is used for crops.

The Sequatchie soils are mostly on moderately high, nearly level flood plains of the Susquehanna River north of Lock Haven, but some areas are on low terraces near Avis. These are deep, well-drained, fertile silt loams and fine sandy loams. They compare favorably with soils of the Ashton series. Sequatchie soils are high in fertility and are farmed intensively, even though they are flooded occasionally. Near the Sequatchie soils are the minor Whitwell, Tygart, and Purdy soils. The Whitwell soils are moderately well drained, the Tygart are somewhat poorly drained, and the Purdy are poorly drained.

Much of this association is used for crops, especially the areas along the Susquehanna River. The soils are moderate to high in fertility and are therefore desirable for farmland.

Use and Management of the Soils

This section gives a general discussion of the suitability of the soils in Clinton County for agriculture and explains management of the soils by capability units. Then management of the soils for trees, for wildlife, and for such engineering purposes as building highways, farm ponds, and similar structures is discussed. Also discussed are productivity ratings for specified crops under two levels of management.

The nonstony soils of Clinton County generally are moderately to highly productive and are easy to work. The agriculture is widely diversified, however, and different management practices are needed for the various crop and pasture plants grown.

Cropland.—A large percentage of the cropland in the county consists of soils that are nearly level to moderately steep and that have slopes longer than 300 feet. Periodic heavy rainfall, especially in summer, causes sheet and gully erosion unless soil conservation practices are followed. The loss of even part of the surface layer reduces the content of organic matter and the supply of plant nutrients and results in an increase in runoff and a decrease in the amount of rainfall absorbed. Erosion can be controlled by grassed waterways, diversion terraces, contour stripcropping, cover crops, good crop rotations, and other conservation measures.

For most of the soils in this county, additional organic matter is needed to improve structure and to increase the water-holding capacity. Organic matter can be supplied by the use of a suitable crop rotation, by green-manure crops, and by applying large amounts of barnyard manure.

A plowsole, or tillage pan, forms occasionally where soils are tilled continuously to the same depth. This pan is difficult for moisture or roots to penetrate. To prevent a pan from forming, the soils should be tilled to various depths, and deep-rooted legumes and grasses should be grown.

Artificial drainage is practical on some of the wetter soils. If drainage is provided, fields can be farmed uniformly, soils can be worked earlier in spring, and yields are better. Tile drains and open drains are suitable in many places. Diversion terraces can be used to control water from adjacent higher areas. A drainage engineer should be consulted if drainage is planned.

The soils of Clinton County are acid and require periodic applications of lime for most crops. Proper liming stimulates microbe activity, helps improve the physical condition of the soil, and provides a more favorable medium for plant growth. Lime and fertilizer should be applied in amounts indicated by soil tests and according to the needs of the crop.

Pastures.—There are two types of pasture in the county—permanent and temporary. The permanent upland pastures are well suited to a mixture of deep-rooted grasses and legumes, such as birdsfoot trefoil mixed with orchardgrass, timothy, or bromegrass. Bluegrass and white Dutch clover do well during the cooler months of the growing season. Upland pastures generally are dormant during July and August. On some farms, narrow flood plains provide good pasture and shade for livestock during these hot months.

Pasture plants that have proven successful on temporary pastures are ladino clover and orchardgrass or sudangrass and small grain, such as rye, wheat, and oats.

In reseeding pastures, slopes of 15 percent or less can be plowed. Slopes of more than 15 percent should be disked. The longer, steeper slopes should be seeded in contour strips.

Pastures generally should be mowed about the 15th of June and the 15th of August to control weeds and tall grass. Overgrazing is detrimental to all pasture plants, but especially to legumes. Fertilizer and lime should be applied in amounts indicated by soil tests and according to the needs of the crop.

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Capability Groups of Soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kind of soils are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes, there can be as many as four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with the growth of plants or with cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, not used in Clinton County, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c* because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally, for example, IIe–1 or IVes–1.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations. The grouping does not take into consideration major, and generally expensive, landforming that would change the slope, depth, or other characteristics of the soil. It also does not take into consideration possible, but unlikely, major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I. Soils that have few limitations that restrict their use.
- Unit I–1. Deep, level to nearly level, well-drained soils on limestone or on material high in lime.
- Unit I–2. Deep, level to nearly level, well-drained, acid soils.
- Unit I–3. Deep, level to nearly level, well-drained soils on flood plains and low stream terraces.
- Unit I–4. Deep, level to nearly level, well-drained, acid soils on flood plains.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Subclass IIe. Soils subject to moderate erosion if they are not protected.
- Unit IIe–1. Deep, nearly level to gently sloping, well-drained soils on limestone or on material that has a high content of lime.
- Unit IIe–2. Deep, nearly level to gently sloping, well-drained soils on acid material.
- Unit IIe–3. Deep, gently sloping, moderately well-drained soils on material that contains some lime.
- Unit IIe–4. Deep, gently sloping, moderately well-drained soils on acid material.
- Unit IIe–5. Shallow to moderately deep, gently sloping, well-drained, acid soils.
- Unit IIe–6. Moderately deep to shallow, gently sloping, well-drained soils on acid material.

Subclass IIw. Soils that have moderate limitations because of excess water.
- Unit IIw–1. Deep, level to nearly level, moderately well drained, silty soils.
- Unit IIw–2. Moderately deep to deep, level to nearly level, moderately well drained, acid soils.
- Unit IIw–3. Deep, level to nearly level, moderately well drained, acid soils on flood plains and low stream terraces.

Subclass IIs. Soils that have moderate limitations of moisture capacity or tilth.
- Unit IIs–1. Moderately deep to deep, level to nearly level, well-drained soils on material from acid shale and sandstone.
- Unit IIs–2. Deep, level to nearly level, well-drained, acid soils on gravelly and sandy stream terraces.
- Unit IIs–3. Deep, gently sloping, well-drained soils on material from sandstone that contains some limestone.
- Unit IIs–4. Moderately deep, level to nearly levels, well-drained soils on acid sandstone.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.
- Unit IIIe–1. Moderately sloping, well-drained soils on limestone or on material that contains much lime.
- Unit IIIe–2. Deep, gently sloping to moderately sloping, well-drained soils.
- Unit IIIe–3. Deep, moderately sloping, moderately well drained soils on acid material.
- Unit IIIe–4. Moderately deep to shallow, gently sloping to moderately sloping, well-drained soils on material from acid shale.
- Unit IIIe–5. Moderately deep, moderately sloping, well-drained, loamy soils.

Unit IIIe–6. Deep, gently sloping to moderately sloping, well-drained soils on limestone.

Subclass IIIw. Soils that have severe limitations because of wetness.

Unit IIIw–1. Deep, level to nearly level, somewhat poorly drained silt loams.

Unit IIIw–2. Deep, gently sloping, somewhat poorly drained soils on acid material.

Unit IIIw–3. Level to nearly level, poorly drained to somewhat poorly drained silt loams on flood plains.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.

Unit IVe–1. Deep, moderately sloping to moderately steep, well-drained soils on limestone or on materials high in lime.

Unit IVe–2. Deep, moderately sloping to moderately steep, well-drained soils on acid material.

Unit IVe–3. Deep, moderately sloping to moderately steep, moderately well drained soils on acid material.

Unit IVe–4. Shallow to moderately deep, moderately sloping and moderately steep, well-drained soils on acid shale.

Unit IVe–5. Moderately deep, moderately steep, well-drained soils on acid sandstone, shale, and conglomerate.

Unit IVe–6. Deep, moderately sloping to moderately steep, well-drained clayey soils on limestone.

Subclass IVw. Soils that have very severe limitations for cultivation, because of excess water.

Unit IVw–1. Nearly level to gently sloping, poorly drained to somewhat poorly drained silt loams.

Unit IVw–2. Gently sloping to moderately sloping, poorly drained, gravelly and silty soils on acid material or on material that contains lime.

Subclass IVes. Soils that have very severe limitations for cultivation because of erosion and stoniness.

Unit IVes–1. Deep, gently rolling to moderately sloping, well-drained, rocky soils on limestone.

Class V. Soils not likely to erode that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, woodland, or wildlife food and cover. (None in Clinton County.)

Class VI. Soils that have severe limitations that make them generally unsuited to cultivation and that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass VIe. Soils severely limited, chiefly by risk of erosion, if they are not protected.

Unit VIe–1. Deep, moderately steep, well-drained, gravelly soils on acid sandstone and shale.

Unit VIe–2. Shallow to moderately deep, moderately steep to steep, well-drained, channery or shaly soils.

Unit VIe–3. Deep, moderately steep, well-drained, clayey soils on limestone.

Unit VIe–4. Moderately deep, moderately steep, poorly drained, gravelly soils.

Subclass VIes. Soils that are severely limited because of erosion and stoniness.

Unit VIes–1. Moderately deep, moderately steep, well-drained soils on limestone in stony and ledgy areas.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by their moisture capacity, stones, or other features.

Unit VIs–1. Deep, nearly level to moderately steep, well-drained, very stony soils.

Unit VIs–2. Deep, nearly level to moderately steep, moderately well drained and well drained, very stony soils.

Unit VIs–3. Moderately deep to deep, nearly level to moderately steep, very stony soils.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing woodland, or wildlife.

Subclass VIIe. Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.

Unit VIIe–1. Shallow, steep to very steep, well-drained, silty soils on acid shale.

Subclass VIIes. Soils very severely limited because of erosion or stones.

Unit VIIes–1. Deep, steep to very steep, well-drained, stony soils on ledgy limestone.

Subclass VIIs. Soils very severely limited by moisture capacity, stones, or other soil features.

Unit VIIs–1. Shallow to moderately deep, nearly level to very steep, well-drained, sandy and stony soils.

Unit VIIs–2. Nearly level to moderately sloping, poorly drained to very poorly drained, very stony soils.

Class VIII. Soils and landforms that, without major reclamation, have limitations that preclude their use for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes.

Subclass VIIIs. Droughty soils that are suited only to recreation and to habitats for wildlife.

Unit VIIIs–1. Nearly level to very steep areas that have as much as 90 percent of the surface covered by large blocks, boulders, cobblestones, and other kinds of stones.

Management by Capability Units

The soils in one capability unit have about the same limitations and similar risks of damage. All of the soils in one unit, therefore, need about the same kind of management, though they may have formed from different kinds of parent material and in different ways.

The capability units are described in the following pages. The soils in each unit are listed, and management suitable for all the soils in one unit is suggested. Addi-

tional help in managing the soils can be obtained by consulting the local representative of the Soil Conservation Service, the county agricultural agent, or a member of the staff of the State Agricultural Experiment Station. Information can also be obtained on how to prepare soil samples from specific fields for tests to indicate the needs for lime and fertilizer for a particular crop. In addition information about crop varieties, suitable management practices, and control measures for weeds, insects, and plant diseases can be obtained.

Suitable crop rotations are described for each unit in terms of high, low, or medium intensity. Types of rotations and suitable crops are described under some of the mapping units in the section "Descriptions of the Soils." The intensity of the rotations is defined as follows:

1. High-intensity (2-year) rotation: 1 year of a row crop followed by a cover crop in winter, and then 1 year of a small grain followed by a green-manure crop or its equivalent; the soils need to be limed and fertilized properly if this kind of rotation is used.
2. Medium-intensity (3-year) rotation: 1 year of a row crop followed by a cover crop in winter, and then 1 year of a small grain followed by 1 year of hay crop or its equivalent; the soils need to be limed and fertilized properly if this kind of rotation is used.
3. Low-intensity (4- or 5-year) rotation: 1 year of a row crop followed by a cover crop in winter, then 1 year of a small grain, and finally, 2 to 3 years of hay or its equivalent; the soils need to be limed and fertilized properly if this kind of rotation is used.

Capability unit I–1

In this unit are deep, level to nearly level, well-drained soils on limestone or on a mixture of materials containing much lime. These soils are medium textured and have good structure. They are moderately permeable, have high available moisture holding capacity, and are productive. The soils are moderately acid, and they are friable and easy to till. They are not eroded or are only slightly eroded. The following soils are in this unit:

Hagerstown silt loam, 0 to 3 percent slopes.
Huntington silt loam, local alluvium, 0 to 3 percent slopes.
Murrill gravelly loam, 0 to 3 percent slopes.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. Contour farming is needed for control of erosion on slopes of more than 2 percent if a crop rotation of high intensity is used. Such a crop rotation can be used if the content of organic matter and the structure of the soils are maintained. The soils also need to be properly fertilized. Cover crops need to be grown, and crop residues should be returned to the soils. Apply lime and fertilizer according to the results of soil tests and the needs of the crop.

Capability unit I–2

In this unit are deep, level to nearly level, well-drained, acid soils that are medium textured and easy to till. They are moderately permeable, have moderately high moisture-holding capacity, and are slightly eroded. The following soils are in this unit:

Allenwood fine sandy loam, 0 to 5 percent slopes.
Hartsells channery loam, 0 to 3 percent slopes.
Sequatchie loam.
Sequatchie fine sandy loam, high.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. A crop rotation of high intensity can be used if the content of organic matter and the structure of the soils are maintained. Cover crops need to be grown, and residues from row crops should be returned to the soils. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop. Generally, however, large amounts of lime are needed.

Capability unit I–3

This unit is made up of deep, level to nearly level, well-drained soils on flood plains and low stream terraces. These soils are medium textured to light textured, have moderate to moderately rapid permeability, and have high moisture-holding capacity. They are nearly neutral, are high in fertility, and are easy to till. They are subject to overflow, but the floodwater normally does not damage crops. The following soils are in this unit:

Ashton silt loam.
Huntington fine sandy loam.
Huntington silt loam.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. A rotation of high intensity can be used if the content of organic matter and the structure of the soils are maintained. The use of proper amounts of fertilizer and the growing of cover crops help to prevent scouring. Apply lime and fertilizer according to the results of soil tests and the needs of the crop.

Capability unit I–4

In this unit are deep, level to nearly level, well-drained, acid soils on flood plains. These soils are medium textured to moderately coarse textured and have moderate to moderately rapid permeability. They are moderately high in fertility. The soils are subject to flooding, but the floodwater causes only slight damage to crops. The following soils are in this unit:

Barbour fine sandy loam.
Pope loam, fans, 0 to 3 percent slopes.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. A rotation of high intensity can be used if the content of organic matter and the structure of the soils are maintained. By applying proper amounts of fertilizer and growing cover crops, scouring can be prevented. Lime and fertilizer should be applied in amounts indicated by soil tests and the needs of the crop. Generally, however, moderate amounts of lime are needed.

Capability unit IIe–1

This unit is made up of deep, nearly level to gently sloping, well-drained soils on limestone or on a mixture of materials that have a high content of lime. These soils are moderately permeable, have high moisture-holding capacity, and are strongly acid to medium acid. Erosion is slight or moderate. The following soils are in this unit:

Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded.
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded.
Huntington silt loam, local alluvium, 3 to 8 percent slopes.
Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. For control of erosion, a suitable crop rotation should be combined with contour stripcropping, return of residues from row crops to the soils, and growing of cover crops. Except on the Huntington silt loam, local alluvium, diversion terraces are also needed in many places. If practices are used for the control of erosion, a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Apply lime and fertilizer according to the results of soil tests.

Capability unit IIe–2

In this unit are deep, nearly level to gently sloping, well-drained soils on acid material. These soils are moderately permeable, have moderately high to high moisture-holding capacity, and are very strongly acid to strongly acid. They are easy to till. Erosion is slight to moderate. The following soils are in this unit:

Allenwood gravelly silt loam, 3 to 8 percent slopes.
Chenango gravelly loam, 3 to 8 percent slopes.
Hartsells channery loam, 0 to 3 percent slopes, moderately eroded.
Hartsells channery loam, 3 to 8 percent slopes.
Hartsells channery loam, 3 to 8 percent slopes, moderately eroded.
Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded.
Meckesville silt loam, 3 to 8 percent slopes, moderately eroded.
Pope loam, fans, 3 to 8 percent slopes.
Ungers loam, 3 to 8 percent slopes.
Ungers loam, 3 to 8 percent slopes, moderately eroded.
Upshur silt loam, acid substratum, 2 to 8 percent slopes.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices for the control of erosion are applied, a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied according to the results of soil tests, but generally, moderate amounts of lime are needed.

Capability unit IIe–3

The only soil in this unit is Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded. It is a deep, gently sloping, moderately well drained, medium-textured soil on material that contains some lime. This soil has high moisture-holding capacity, is strongly acid to medium acid, and is easy to till. Erosion is moderate.

This soil is suited to corn, small grain, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soil. If practices for the control of erosion are applied, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop.

Capability unit IIe–4

In this unit are deep, gently sloping, moderately well drained, acid soils that are medium textured. These soils have moderately high moisture-holding capacity, are very strongly acid to strongly acid, and are slightly eroded to moderately eroded. They have moderate fertility and are easy to till. A layer that is slowly permeable to water and plants is at a depth of nearly 20 inches. The following soils are in this unit:

Albrights silt loam, 3 to 8 percent slopes.
Buchanan gravelly loam, 3 to 8 percent slopes.
Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded.
Comly silt loam, 3 to 8 percent slopes, moderately eroded.
Cookport loam, 3 to 8 percent slopes.
Cookport loam, 3 to 8 percent slopes, moderately eroded.
Leadvale silt loam, 3 to 8 percent slopes.

These soils are suited to corn, small grain, and other general farm crops. Alfalfa grows fairly well if adequate amounts of lime and fertilizer are applied. A rotation of medium intensity, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices for the control of erosion are applied, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop.

Capability unit IIe–5

This unit is made up of shallow to moderately deep, gently sloping, well-drained soils on material from acid shale. These soils are in the uplands. They are medium textured, have moderate permeability, and are medium acid to strongly acid. They have moderate to moderately low moisture-holding capacity. These soils are friable and are easy to till, but they have moderately low fertility. Erosion is slight to moderate. The following soils are in this unit:

Berks channery silt loam, 3 to 8 percent slopes, moderately eroded.
Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded.
Gilpin silt loam, 3 to 8 percent slopes.
Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded.
Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded.

These soils are suited to corn, small grain, alfalfa, birdsfoot trefoil, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices for the control of erosion are applied, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop. Generally, however, moderate amounts of lime are needed.

Capability unit IIe–6

In this unit are moderately deep to shallow, gently sloping, well-drained soils on acid material from sandstone, shale, and conglomerate. These soils are medium textured, are acid, and are permeable to water and to plants. They

have moderate to moderately low ability to hold water available for plants. These soils are friable and are easy to work, but they are moderately low in fertility. Erosion is slight to moderate. The following soils are in this unit:

Dekalb channery loam, 3 to 8 percent slopes.
Dekalb channery loam, 3 to 8 percent slopes, moderately eroded.

These soils are suited to potatoes, corn, small grain, alfalfa, birdsfoot trefoil, and other general farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are used for control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 1 year of hay. Leaching is rapid, and fertilizer must be applied frequently to maintain fertility. Lime should be applied in amounts indicated by soil tests, but generally moderate to large amounts of lime are needed.

Capability unit IIw–1

Wiltshire silt loam, 0 to 3 percent slopes, is the only soil in this unit. This deep, level to nearly level, moderately well drained, medium-textured soil formed on material containing some lime. The soil has moderately high moisture-holding capacity, is moderately acid, and is slightly eroded. It is friable and easy to till. A layer that is slowly permeable to water and plant roots is at a depth of more than 20 inches.

This soil is suited to corn, small grain, birdsfoot trefoil, and other farm crops. If a crop rotation of medium intensity is used, graded stripcropping is needed for control of erosion and to provide drainage on slopes of more than 2 percent. Drainage generally is needed for high yields. A suitable crop rotation and adequate amounts of fertilizer are needed to maintain the content of organic matter and the structure of the soil. Cover crops are also needed, and residues from row crops should be returned to the soil. If practices are used for the control of erosion, a suitable cropping system is 1 year of hay, 1 year of a small grain, and 1 year of a row crop. Apply lime and fertilizer according to the results of soil tests.

Capability unit IIw–2

In this unit are moderately deep to deep, level to nearly level, moderately well drained, acid soils. These soils are medium textured and are easy to till. They have moderately high moisture-holding capacity for plants and are very strongly acid to strongly acid. Runoff is slow, and permeability is moderately slow; consequently, drainage is a problem. The following soils are in this unit:

Comly silt loam, 0 to 3 percent slopes.
Cookport loam, 0 to 3 percent slopes.
Watson silt loam, 0 to 5 percent slopes.
Whitwell silt loam, 0 to 5 percent slopes, moderately eroded.

These soils are suited to corn and small grain, but they are only fairly well suited to alfalfa. Graded stripcropping is needed for control of erosion and to provide drainage on slopes of more than 2 percent. Drainage is needed for high yields. A suitable crop rotation and adequate amounts of fertilizer are needed to maintain the content of organic matter and the structure of the soils. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 1 year of hay. Apply lime and fertilizer according to the results of soil tests. Generally, however, moderate to large amounts of lime are required.

Capability unit IIw–3

This unit is made up of deep, level to nearly level, moderately well drained, acid soils in alluvium on flood plains. The soils have moderate permeability and high moisture-holding capacity. They are medium textured and are moderately high in fertility but are subject to moderate overflow in some years. The following soils are in this unit:

Basher fine sandy loam.
Basher silt loam.
Lindside silt loam.

The Lindside soil is less acid than the Basher soils, and it is higher in fertility. All of the soils are suited to corn, small grain, and other farm crops, but they are fairly well suited to alfalfa. Drainage is needed for good yields. The content of organic matter and the structure of the soils can be maintained if a suitable crop rotation is used, if the soils are properly fertilized, and if cover crops are grown to prevent scouring. A suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Apply lime and fertilizer according to the results of soil tests.

Capability unit IIs–1

This unit is made up of moderately deep to deep, level to nearly level, well-drained soils on material weathered from acid shale and fine-grained sandstone. These soils are acid and are medium textured. They have moderate to moderately rapid permeability, moderate to low available moisture-holding capacity, and moderate to low fertility. These soils are not eroded or are only slightly eroded. The following soils are in this unit:

Gilpin silt loam, 0 to 3 percent slopes.
Hartleton channery silt loam, 0 to 3 percent slopes.

These soils are suited to corn, small grain, birdsfoot trefoil, alfalfa, and other general farm crops grown in the county. Contour farming is needed for control of erosion on slopes of more than 2 percent. The content of organic matter and the structure of the soils can be maintained if a suitable crop rotation is used and the soils are properly fertilized. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are used for the control of erosion, a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop. Generally, however, moderate amounts of lime are required.

Capability unit IIs–2

The only soil in this unit is Chenango gravelly loam, 0 to 3 percent slopes. It is a deep, level to nearly level, well-drained, acid soil on gravelly and sandy stream terraces.

The lower part of its subsoil is very gravelly. This soil is rapidly permeable and has moderate to low capacity to hold water available for plant use. It has little or no erosion.

This soil is suited to corn, small grain, alfalfa, and other farm crops grown in the county. The content of organic matter and the structure of the soil can be maintained if a suitable crop rotation is used, the soil is properly fertilized, cover crops are grown, and the residues from row crops are returned to the soil. Farming on the contour is needed for the control of erosion on slopes of more than 2 percent. If practices are used for the control of erosion, a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied according to the results indicated by soil tests. Generally, however, moderate amounts of lime are needed, and crops on this soil respond well if lime is added.

Capability unit IIs–3

Only Morrison cherty sandy loam, 3 to 8 percent slopes, is in this unit. This deep, gently sloping, well-drained soil formed in uplands on material from sandstone that contains small amounts of limestone. This soil is coarse textured and is easy to till. It is easily permeable to water and plant roots and has moderate moisture-holding capacity. The soil is medium acid to strongly acid, is moderately low in fertility, and is slightly eroded.

This soil is suited to corn, small grain, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops should also be grown, and residues from row crops should be returned to the soil. If practices are applied for the control of erosion, a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Apply lime and fertilizer according to the results of soil tests and the needs of the crop. Generally, however, moderate amounts of lime and fertilizer are needed, and they should be applied frequently.

Capability unit IIs–4

Dekalb channery loam, 0 to 3 percent slopes, is the only soil in this unit. It is a moderately deep, level to nearly level, well-drained soil on acid gray sandstone. This soil is in uplands. It is acid, friable, and easy to work, but it is low in fertility. It has moderate to moderately low ability to hold water for plants, and it is permeable to water and plant roots. The soil is medium textured. It is not eroded or is only slighty eroded.

This soil is suited to corn, small grain, birdsfoot trefoil, and other general farm crops. Contour farming is needed for control of erosion on slopes of more than 2 percent. The content of organic matter and the structure of the soil can be maintained if a suitable crop rotation is used and the soil is properly fertilized. Residues from row crops should be returned to the soil, and cover crops are also needed. If practices are used for the control of erosion, a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay. Lime and fertilizer should be applied in amount indicated by soil tests, and moderate to large amounts are generally needed for good yields.

Capability unit IIIe–1

This unit is made up of deep, moderately sloping, well-drained, medium-textured soils that formed on limestone or on a mixture of material that contains much lime. The soils are moderately permeable to water and plant roots, have high moisture-holding capacity, and are high in fertility. They are medium acid to strongly acid, even though over limestone. The following soils are in this unit:

Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded.
Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are applied for the control of erosion, a suitable cropping system is 1 year each of a row crop and a small grain and 2 or 3 years of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop.

Capability unit IIIe–2

This unit is made up of deep, gently sloping to moderately sloping, well-drained, medium-textured soils on acid material. These soils have moderately high moisture-holding capacity and are moderately permeable to water and to plant roots. They are strongly acid to very strongly acid. Fertility is moderate, but the soils are moderately eroded to slightly eroded. The following soils are in this unit:

Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded.
Hartselle channery loam, 8 to 15 percent slopes, moderately eroded.
Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded.
Meckesville silt loam, 8 to 15 percent slopes, moderately eroded.
Ungers loam, 8 to 15 percent slopes.

These soils are suited to corn, small grain, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop.

Capability unit IIIe–3

This unit is made up of deep, moderately sloping, moderately well drained soils on acid material. These soils are in the uplands. They are medium textured and have moderately high moisture-holding capacity. The soils are strongly acid, have moderate fertility, and are easy to till, but they are slightly eroded to moderately eroded. A layer that is slowly permeable to water and plants is about 20 inches below the surface. The following soils are in this unit:

Albrights silt loam, 8 to 15 percent slopes, moderately eroded.
Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded.

Comly silt loam, 8 to 15 percent slopes, moderately eroded.
Cookport loam, 8 to 15 percent slopes.
Leadvale silt loam, 8 to 15 percent slopes.

These soils are suited to corn, small grain, alfalfa, and other farm crops grown in the county. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Also, cover crops are needed, and residues from row crops should be returned to the soils. If practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Lime and fertilizer should be added in amounts indicated by soil tests and the needs of the crop, but moderate amounts of lime are generally needed.

Capability unit IIIe-4

In this unit are moderately deep to shallow, gently sloping to moderately sloping, well-drained soils on material from acid shale. These soils are in the uplands. They are medium textured, are moderately permeable to water and to plant roots, and have moderate to moderately low moisture-holding capacity. These soils are moderately low in fertility, are medium acid to strongly acid, are friable, and are easy to till but erode readily. They are slightly eroded to severely eroded and are subject to further erosion because runoff is rapid. The following soils are in this unit:

Berks channery silt loam, 8 to 15 percent slopes, moderately eroded.
Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded.
Gilpin silt loam, 8 to 15 percent slopes.
Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded.
Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded.

These soils are suited to corn, small grain, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soil. If practices are applied for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop.

Capability unit IIIe-5

This unit is made up of moderately deep to deep, moderately sloping, well-drained soils on material from acid sandstone, shale, and conglomerate. These soils are in the uplands. They are medium textured, are permeable to water and plant roots and have moderately low to low moisture-holding capacity. These soils are slightly eroded to moderately eroded. They are very strongly acid to strongly acid and are friable and easy to till, but they are low in fertility. The following soils are in this unit:

Dekalb channery loam, 8 to 15 percent slopes.
Dekalb channery loam, 8 to 15 percent slopes, moderately eroded.

These soils are suited to small grain, birdsfoot trefoil, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are applied for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Lime and fertilizer should be added according to the results of soil tests. Generally, however, moderate to large amounts of lime are needed.

Capability unit IIIe-6

In this unit are deep, gently sloping to moderately sloping soils on limestone. These soils are in the uplands. They are well drained, moderately fine textured, and highly fertile, but they are medium acid and moderately eroded. The available moisture-holding capacity for plants is moderate to low, and permeability is moderately slow; however, the soils are permeable to plants above bedrock. Generally these soils are more shallow to limestone bedrock than the Hagerstown silt loams, and they also contain more ledges. The following soils are in this unit:

Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded.
Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded.

The soils in this unit are suited to small grain, corn, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. Where practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Apply lime and fertilizer according to the results of soil tests and the needs of the crop.

Capability unit IIIw-1

This unit is made up of deep, level to nearly level, somewhat poorly drained soils on acid material. These soils are in the uplands. They are medium textured and are slightly eroded. The soils are slowly permeable. They have moderately low available moisture holding capacity, moderately low fertility, and are strongly acid. Runoff and permeability are slow, and as a result, drainage is a problem. A claypan at a depth of 12 to 14 inches restricts penetration of roots. The following soils are in this unit:

Cavode silt loam, 0 to 3 percent slopes.
Tygart silt loam.

These soils are suited to spring small grain, birdsfoot trefoil, and similar farm crops, but they are poorly suited to corn. Drainage is needed for good yields, and unless the soils are drained, crops sensitive to wetness should not be planted.

The content of organic matter and the structure of the soils can be maintained if a suitable crop rotation is used, if the soils are properly fertilized, and if residues from row crops are returned to the soils. If practices are used for the control of erosion and if drainage is provided, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Graded stripcropping and diversion terraces are necessary for the control of erosion. These practices also help to provide surface drainage. Lime and fertilizer should be applied accord-

ing to the results of soil tests. Generally, however, moderate to large amounts of lime are required.

Capability unit IIIw–2

Cavode silt loam, 3 to 8 percent slopes, is the only soil in this unit. It is a deep, gently sloping, somewhat poorly drained soil on acid material. This soil is medium textured, is slowly permeable to water and plant roots, and has moderately low available moisture-holding capacity. It is strongly acid and is low in fertility. Erosion is slight to moderate.

This soil is suited to spring small grain and birdsfoot trefoil, but it is poorly suited to corn. A suitable crop rotation, graded stripcropping, and diversion terraces are all needed for the control of erosion. Also, adequate amounts of fertilizer should be applied and residues from row crops should be returned to the soil. Diversion terraces and graded stripcropping also help to provide drainage. If practices are used for the control of erosion and if drainage is provided, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 2 or 3 years of hay. Lime and fertilizer should be applied in amounts indicated by soil tests. Generally, however, moderate amounts of lime are required.

Capability unit IIIw–3

This unit is made up of level to nearly level, poorly drained to somewhat poorly drained soils in alluvium on flood plains. These soils are medium textured and are not eroded or are only slightly eroded. They have high available moisture-holding capacity for plants. These soils are subject to frequent overflow, but the floodwater seldom damages crops. The water table is high. The following soils are in this unit:

Atkins silt loam.
Melvin and Newark silt loams.

If these soils are drained, they are suited to spring small grain, corn, birdsfoot trefoil, and other farm crops. Drainage is necessary for satisfactory yields. The content of organic matter and the structure of the soils can be maintained if a suitable crop rotation is used, if the soils are properly fertilized, and if cover crops are grown to prevent scouring. If drainage is provided, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 3 years of hay. Apply lime and fertilizer according to the results of soil tests and the needs of the crop.

Capability unit IVe–1

This unit is made up of deep, moderately sloping to moderately steep, well-drained soils on limestone or on a mixture of material that contains much lime. These soils are in the uplands. They are medium textured, are moderately permeable to water and plant roots, and have moderately high moisture-holding capacity. The soils are medium acid to strongly acid. They are high in fertility but are slightly eroded to severely eroded. The following soils are in this unit:

Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded.
Murrill gravelly loam, 8 to 15 percent slopes, severely eroded.
Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded.

These soils are suited to corn, small grain, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces on slopes of as much as 15 percent, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. If practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 3 or more years of hay. Apply lime and fertilizer according to the results of soil tests and the needs of the crop.

Capability unit IVe–2

This unit is made up of deep, moderately sloping to moderately steep, well-drained soils on acid material. These soils are in the uplands. They are medium textured and are slightly eroded to severely eroded. The soils have moderate moisture-holding capacity and are moderately permeable to water and to plant roots. They are strongly acid and are moderately low in fertility. Runoff is rapid, and the hazard of erosion is severe. The following soils are in this unit:

Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded.
Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded.
Meckesville silt loam, 15 to 25 percent slopes, moderately eroded.

These soils are suited to birdsfoot trefoil, corn, alfalfa, small grain, and other farm crops. A suitable crop rotation, contour stripcropping, diversion terraces on slopes of as much as 15 percent, and adequate amounts of fertilizer are all needed for control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soils. A suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 years of hay, if practices for the control of erosion are applied. Lime and fertilizer should be added according to the results of soil tests and the needs of the crop, but moderate to large amounts are generally needed.

Capability unit IVe–3

This unit is made up of deep, moderately sloping to moderately steep, moderately well drained soils on acid material. These soils are medium textured and are slightly eroded to moderately eroded. They are moderately permeable to slowly permeable, have moderate moisture-holding capacity, and are moderately low in fertility. They are strongly acid. Runoff is rapid, and permeability is moderate to slow. As a result, the hazard of erosion is severe. A layer that is slowly permeable to water is at a depth of about 20 inches. The following soils are in this unit:

Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded.
Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded.

These soils are suited to corn, birdsfoot trefoil, timothy, and other farm crops that are not sensitive to wetness. They are best suited to hay and pasture. For the control of erosion, reseeding should be done in contour strips on all slopes and on diversion terraces that have slopes of as much as 15 percent. A suitable cropping system is 1 year of a cultivated crop, 1 year of a small grain, and 4 or more years of hay. Adding proper amounts of fertilizer lengthens the life of stands of forage. Lime should be added according to the results of soil tests and the needs

of the crop. Generally, however, moderate amounts of lime and fertilizer are needed.

Capability unit IVe-4

This unit is made up of shallow to moderately deep, moderately sloping and moderately steep, well-drained soils on acid shale. These soils are in the uplands. They are medium textured and are moderately permeable to water and plant roots. They have moderately low to low moisture-holding capacity for plants, and as a result, runoff is rapid. The soils are friable and are medium acid to strongly acid. They erode readily and are slightly eroded to severely eroded. The following soils are in this unit:

Berks channery silt loam, 15 to 25 percent slopes.
Berks channery silt loam, 15 to 25 percent slopes, moderately eroded.
Berks shaly silt loam, 15 to 25 percent slopes.
Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded.
Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded.
Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded.

These soils are suited to corn, small grain, birdsfoot trefoil, timothy, and other farm crops. Contour strips and diversion terraces can be used to help control erosion when reseeding is done. A suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 or more years of hay. Applying proper amounts of fertilizer helps to lengthen the life of stands of forage. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop. Generally, however, moderate amounts of lime are needed.

Capability unit IVe-5

Dekalb channery loam, 15 to 25 percent slopes, is the only soil in this unit. It is a moderately deep to deep, moderately steep, well-drained soil on acid sandstone, shale, and conglomerate. This soil is in the uplands. It is permeable to moisture and plant roots, has low moisture-holding capacity, is very strongly acid to strongly acid, and is low in fertility. Erosion is slight to moderate.

This soil is suited to small grain and birdsfoot trefoil, and farm crops can be grown occasionally. Corn is poorly suited. A rotation of low intensity, contour stripcropping, diversion terraces, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops should also be grown, and residues from row crops should be returned to the soil. If practices are applied for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 or more years of hay. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop, but large amounts are generally needed.

Capability unit IVe-6

Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded, is the only soil in this unit. It is a deep, moderately sloping to moderately steep, moderately fine textured, well-drained soil on limestone. It has moderately slow permeability to moisture but is permeable to plant roots above bedrock. On the average, this soil is more shallow than Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded, because it contains many rock ledges. It has moderately low capacity to hold moisture available for plants, is medium acid, and is high in fertility. Runoff is rapid, and the hazard of erosion is severe. This soil is very sticky and plastic when wet, and consequently, it is difficult to manage.

This soil is suited to corn, winter grain, alfalfa, orchardgrass, bromegrass, and other farm crops. If practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 years of hay. In some places this soil is easier to manage if pasture or hay is grown. Contour stripcropping and diversion terraces on slopes of as much as 15 percent help to control erosion if reseeding is done. Areas in hay or pasture that require reseeding should be seeded to small grain. Fertilizing the soil properly helps to lengthen the life of the stands of forage.

Capability unit IVw-1

In this unit are nearly level to gently sloping, poorly drained to somewhat poorly drained soils on acid material. These soils are in depressions and in slack-water areas in the uplands. They are slightly eroded to moderately eroded. These soils are slowly permeable to very slowly permeable to water, and they have a pan at a depth of 8 to 12 inches that restricts penetration of roots. The soils are medium textured, are low in fertility, and are strongly acid. Draining these soils is difficult because of slow runoff and permeability. The following soils are in this unit:

Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded.
Nolo silt loam, 0 to 3 percent slopes.
Purdy silt loam.

The soils in this unit are best suited to hay, birdsfoot trefoil, timothy, and similar crops. Open drains or bedding systems provide surface drainage and improve growth of plants. A suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 or more years of hay. Fertilizing the soils properly and adding lime help to lengthen the life of the stands of forage. The fertilizer and lime should be applied according to the results of soil tests.

Capability unit IVw-2

In this unit are gently sloping to moderately sloping, poorly drained, medium-textured soils on acid material or on material that contains lime. These soils are at the heads of streams and coves in uplands. They are slowly permeable to water, and during most of the year their rooting zone is restricted to a depth of 6 to 10 inches. The soils are slightly eroded to moderately eroded, and they have low to moderate fertility. The following soils are in this unit:

Andover gravelly loam, 2 to 8 percent slopes.
Andover gravelly loam, 2 to 8 percent slopes, moderately eroded.
Andover gravelly loam, 8 to 15 percent slopes, moderately eroded.
Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded.
Lickdale silt loam, 0 to 5 percent slopes.

If drainage is feasible, these soils are suited to birdsfoot trefoil, corn, small grain, timothy, and other farm crops. A suitable crop rotation, graded stripcropping, diversion terraces, and adequate amounts of fertilizer are needed for the control of erosion and to remove excess water. Cover crops are also needed, and residues from row crops should

be returned to the soils. A suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 or more years of hay. Tile can be used to drain wet spots. Applying proper amounts of fertilizer and lime help to lengthen the life of stands of forage. The lime and fertilizer should be applied according to the results of soil tests and the needs of the crop, but generally, moderate amounts of lime are needed.

Capability unit IVes–1

The only soil in this unit is Hagerstown rocky silt loam, 5 to 15 percent slopes. It is a deep, gently rolling to moderately sloping, well-drained, moderately fine textured soil on limestone. This soil is highly fertile, is medium acid to slightly acid, and is slightly eroded to moderately eroded. It is moderately permeable to water, and plant roots penetrate readily to bedrock. The moisture-holding capacity for plants is moderately low. On the average, this soil is more shallow to limestone than the other soils in the Hagerstown series because it contains many rock ledges. In many places stones and outcrops of limestone make plowing difficult, but in a few places the soil can be plowed.

This soil is suited to corn, small grain, alfalfa, and other farm crops. A suitable crop rotation, contour stripcropping, and adequate amounts of fertilizer are all needed for the control of erosion. Cover crops are also needed, and residues from row crops should be returned to the soil. If practices are used for the control of erosion, a suitable cropping system is 1 year of a row crop, 1 year of a small grain, and 4 or more years of hay.

Capability unit VIe–1

The only soil in this unit is Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded. It is a deep, moderately steep, well-drained, medium-textured soil on acid sandstone and shale. This soil is in the uplands. It has moderate available moisture holding capacity, and it is moderately permeable to water and plant roots. The soil is moderately low in fertility and is strongly acid to very strongly acid. Runoff is rapid, and the soil is severely eroded.

This soil is suited to grasses and legumes for hay and pasture. Erosion can be controlled if reseeding is done in contour strips. Applying proper amounts of fertilizer and adding lime help to lengthen the life of stands of forage. Lime should be applied according to the results of soil tests, but moderate amounts are generally needed.

Capability unit VIe–2

This unit is made up of shallow to moderately deep, moderately steep to steep, well-drained, medium-textured soils on acid shale. These soils are in the uplands. They have low moisture-holding capacity and are moderately permeable. Plant roots readily penetrate to bedrock. Runoff is rapid, and fertility is low. The soils are strongly acid to medium acid and are slightly eroded to severely eroded. The following soils are in this unit:

Berks channery silt loam, 25 to 35 percent slopes.
Berks channery silt loam, 25 to 35 percent slopes, moderately eroded.
Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded.
Berks-Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded.
Leck Kill channery silt loam, 25 to 35 percent slopes.
Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded.

These soils are suited to pasture or trees. Reseeding the pastures in narrow contour strips helps to control erosion. Fertilizing the soils in proper amounts and adding lime help to lengthen the life of the stands of forage. The lime and fertilizer should be applied according to the results of soil tests. Yields are likely to be low during droughts because of the small amount of moisture in the soils.

Capability unit VIe–3

The only soil in this unit is Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded. It is a deep, moderately steep, well-drained, moderately fine textured soil on limestone. This soil is in the uplands. It is very fertile, is medium acid to slightly acid, and is severely eroded. The available moisture holding capacity for plants is moderate. Permeability to water is moderately slow, but plant roots penetrate the soil to bedrock. Generally this soil is more shallow to limestone than the Hagerstown silt loams. It is very sticky and plastic when wet, and good tilth is difficult to maintain in cultivated areas.

This soil is suited to tall grasses, alfalfa, birdsfoot trefoil, and other farm crops and is well suited to hay and pasture. Reseeding in narrow contour strips helps to control erosion. Fertilizing in proper amounts and adding lime lengthens the life of stands of forage. The lime and fertilizer should be applied according to the results of soil tests.

Capability unit VIe–4

Andover gravelly loam, 15 to 25 percent slopes, moderately eroded, is the only soil in this unit. It is a moderately deep, moderately steep, poorly drained, medium-textured soil on acid material. This soil occupies areas below springs and seeps in the uplands and is wet much of the year. The soil is strongly acid to medium acid and is low in fertility. It is slowly permeable to water, and depth of the rooting zone that is favorable for plants is 6 to 10 inches during most of the year. The soil is moderately eroded.

This soil is suited to pasture, and plants that tolerate wetness produce the highest yields. Reseeding in narrow contour strips helps control erosion. Where practical, surface drainage improves growth of plants. Applying adequate amounts of lime and fertilizer helps to lengthen the life of stands of forage. The lime and fertilizer should be applied according to the results of soil tests.

Capability unit VIes–1

The only soil in this unit is Hagerstown rocky silt loam, 15 to 25 percent slopes. It is a moderately deep, moderately steep, well-drained soil on limestone. This soil is in stony and ledgy areas in the uplands. It is medium textured, is moderately permeable to water, and consequently, has moderately low moisture-holding capacity. Plant roots readily penetrate to bedrock. The soil is medium acid to slightly acid and is highly fertile. Erosion is moderate. Outcrops of limestone occur, but they do not hinder occasional disking or other work needed for pasture improvement.

This soil is best suited to hay and pasture, but it is also suited to alfalfa, orchardgrass, bromegrass, and other farm crops. Reseeding should be done in contour strips. If

adequate amounts of fertilizer are added to grasses and legumes, reseeding needs to be done less frequently. Lime and fertilizer should be applied according to the results indicated by soil tests.

Capability unit VIs–1

In this unit are deep, nearly level to moderately steep, well-drained, very stony soils on acid material that overlies limestone. These soils are in the uplands. They are medium textured, are moderately permeable to water and plant roots, have high moisture-holding capacity, and are only slightly eroded. They are medium acid to strongly acid and are highly fertile. There are large sandstones in many places, and as a result, plowing is not feasible. The following soils are in this unit:

Murrill very stony loam, 0 to 8 percent slopes.
Murrill very stony loam, 8 to 25 percent slopes.

Because of the many large stones, these soils are better suited to pasture and trees than to row crops. Where it is feasible to use light farm equipment, stands of native bluegrass and whiteclover can be encouraged by adding fertilizer. Lime and fertilizer should be added in amounts indicated by soil tests. Woodland needs protection from fire and grazing.

Capability unit VIs–2

This unit is made up of deep, nearly level to moderately steep, moderately well drained and well drained, very stony soils on acid material. These soils are medium-textured to moderately coarse textured, and in some places they are slightly eroded. They are strongly acid and are moderately fertile. These soils are moderately permeable to water and plant roots and have moderately high capacity to hold moisture available for plants. They contain many large sandstone fragments; consequently, plowing is not feasible. The following soils are in this unit:

Buchanan very stony loam, 0 to 8 percent slopes.
Buchanan very stony loam, 8 to 25 percent slopes.
Cookport very stony loam, 0 to 8 percent slopes.
Cookport very stony loam 8 to 25 percent slopes.
Hartsells very stony loam, 0 to 8 percent slopes.
Laidig very stony loam, 0 to 8 percent slopes.
Laidig very stony loam, 8 to 25 percent slopes.
Pope very stony loam.

These soils are suited to native pasture. Fertilizer is needed to encourage the growth of bluegrass and whiteclover. Lime should be added according to the results of soil tests. Woodland needs protection from fire and grazing. Suitable trees for reforested areas are given in the section "Woodland Uses of the Soils."

Capability unit VIs–3

This unit is made up of moderately deep to deep, nearly level to moderately steep, well-drained soils that are coarse textured. These soils are in the uplands on acid sandstone, shale, and conglomerate. Permeability is moderately rapid, and the available moisture for plants is moderately low. The soils are low in fertility and are very strongly acid to strongly acid. They contain many large sandstone fragments, which make plowing unfeasible, and they are slightly eroded. The following soils are in this unit:

Dekalb very stony soils, 0 to 8 percent slopes.
Dekalb very stony soils, 8 to 25 percent slopes.
Lehew very stony loam, 8 to 25 percent slopes.

These soils are suited to native pasture and trees. Growth of bluegrass and whiteclover can be encouraged if small amounts of fertilizer are applied frequently. Generally large amounts of lime are needed for maintaining stands of legumes. Apply lime and fertilizer according to the results of soil tests. Protect woodland from fire and grazing. Suitable trees for reforested areas are named in the section "Woodland Uses of the Soils."

Capability unit VIIe–1

This unit is made up of shallow, steep to very steep, well-drained soils on acid shale. These soils are in the uplands. They are medium textured, and they have low available moisture holding capacity. Permeability is moderate, runoff is rapid, and the soils are slightly eroded to severely eroded. These soils are low in fertility and are medium acid. The following soils are in this unit:

Berks-Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded.
Berks-Montevallo channery silt loams, 35 to 100 percent slopes.
Berks-Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded.
Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded.
Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded.

The soils in this unit are best suited to trees. The trees need to be protected from fires, and the areas need fencing that will protect them from grazing. Suitable trees for planting in reforested areas are named in the section "Woodland Uses of the Soils."

Capability unit VIIes–1

The only soil in this unit is Hagerstown rocky silty clay loam, 25 to 70 percent slopes. It is a deep, steep to very steep, well-drained, stony soil on ledgy limestone. This soil is in the uplands. It has low moisture-holding capacity, and it is moderately permeable to water. Plant roots readily penetrate to bedrock. The soil is medium acid to slightly acid, is high in fertility, and is slightly eroded. Generally this soil is more shallow than the other Hagerstown soils because it contains many stones and ledges.

This soil is suited to trees, but they need to be protected from fire and grazing. Suitable trees for planting in reforested areas are named in the section "Woodland Uses of the Soils."

Capability unit VIIs–1

In this unit are shallow to moderately deep, nearly level to very steep, well-drained soils, on acid sandstone, shale, and conglomerate. These soils are in the uplands. They are moderately coarse textured to coarse textured, and in places they are slightly eroded. The soils are low in fertility and are extremely acid to strongly acid. The available moisture holding capacity is low, and permeability is moderately rapid to rapid. The following soils are in this unit:

Dekalb very stony soils, 25 to 100 percent slopes.
Leetonia very stony sandy loam, 0 to 8 percent slopes.
Leetonia very stony sandy loam, 8 to 25 percent slopes.
Lehew very stony loam, 25 to 100 percent slopes.

These soils are not suited to crops; therefore, they should remain in trees. The trees need protection from fire and grazing.

Capability unit VIIs-2

In this unit are nearly level to moderately sloping, poorly drained to very poorly drained, medium-textured, very stony soils on acid material. These soils are in seep areas and in depressions in the uplands. They are slowly permeable to water, and growth of roots is restricted to the upper 6 to 10 inches. They have low fertility and are strongly acid to medium acid. Because of many sandstone boulders, it is not feasible to use farm equipment on these soils. The following soils are in this unit:

Andover very stony loam, 0 to 8 percent slopes.
Andover very stony loam, 8 to 25 percent slopes.
Lickdale very stony silt loam.
Nolo very stony silt loam, 0 to 8 percent slopes.

These soils are not suited to crops, but they are suited to trees. The trees need protection from fire and grazing.

Capability unit VIIIs-1

In this unit are nearly level to very steep areas that have as much as 90 percent of the surface covered by large boulders, blocks, cobblestones, or rounded stones of sandstone and quartzite. Fine and coarse soil particles make up 10 percent or less of the volume. The available moisture-holding capacity is very low, permeability is very rapid, and fertility is very low. Stony alluvial land and Riverwash are subject to frequent floods. In some places they have a high water table within 3 feet of the surface during most of the year. The following land types are in this unit:

Riverwash.
Rubble land.
Stony alluvial land.
Stony land.

These land types are suitable as habitats for wildlife. A cover of trees and shrubs is needed for the control of erosion where they can be grown. Protection from fire is required.

Productivity Ratings of the Soils

Table 1 shows estimated productivity ratings for representative field crops grown in the county. It also gives the relative productivity of the soils for pasture. The estimates are based largely on interviews with farmers and on observations of agricultural workers who have had experience with the soils and crops of the county.

Each productivity rating indicates the estimated productivity of the soil for a particular crop in relation to a standard index of 100. The standard index represents the average acre yield obtained on the most productive soils in the county under normal management. The average acre yield represented by the standard index is given at the head of the columns for each crop. The average yield figures are based on yields produced during the years when the soil survey was being made.

The productivity ratings are given for two levels of management. In columns A are ratings to be expected under normal, or prevailing, management. These ratings are based on records of yields obtained during an average growing season and under management presently practiced by most of the farmers in the county. In columns B are ratings that indicate yields that may be obtained in a favorable season when improved management is used. Improved management includes the application of enough lime, manure, and commercial fertilizer; the proper use of cropping systems and crop residues; the use of drainage where needed; the control of runoff, erosion, weeds, brush, insects, and plant diseases; proper preparation of the seedbed; and selection of suitable varieties of crops and forage plants.

An index of 50 indicates that the soil is only about half as productive for the specified crop as a soil that has a standard index of 100. By fertilizing heavily, or by using other intensive management, an index of more than 100 can be obtained for some soils. Ashton silt loam, for example, has a rating of 100 for most crops listed. Consequently, under the prevailing level of management (columns A), the farmer can expect to obtain average yields per acre of 80 bushels of corn for grain, 12 tons of corn grown for silage, 50 bushels of oats, and 3 tons of an alfalfa-grass mixture. Under improved management (columns B) the same soil has a productivity rating of 200 for corn grown for grain, 200 for corn grown for silage, 150 for oats, and 150 for an alfalfa-grass mixture. This means that yields per acre under improved management would equal 160 bushels of corn for grain, 24 tons of corn grown for silage, 75 bushels of oats, and 4½ tons of an alfalfa-grass mixture. No ratings are given in table 1 for soils that are not suited to a particular crop.

Woodland Uses of the Soils [1]

When settlement first began in the county, dense forest covered the area. Cutting for commercial purposes and clearing for farming eliminated the virgin stands of timber. Now the woodland consists of second- and third-growth stands. The principal forest types that make up the present woodland (*10*),[2] and the approximate extent (*17*) of each follows:

	Percentage of total woodland in county
Northern red oak	49
Northern red oak predominates; associates are black oak, scarlet oak, chestnut oak, and tulip-poplar.	
Chestnut oak	27
Chestnut oak predominates; common associates are scarlet oak, white oak, black oak, pitch pine, black gum, and red maple; occasional associates are white pine, red oak, and Virginia pine.	
Sugar maple-beech-yellow birch	6
Sugar maple, beech, and yellow birch are predominant; associates are basswood, red maple, red oak, white pine, and black cherry.	
Aspen-gray birch	6
Quaking aspen, bigtooth aspen, and balsam poplar make up this type, singly or in various combinations with each other, or with associates; principal associates are pin cherry, yellow birch, paper birch, white pine, white ash, sugar maple, northern red oak, and white oak.	
Other kinds of trees	12

Sawtimber stands make up approximately 27 percent of the acreage in commercial forests. Pole timber accounts for 64 percent, and seedlings, for 9 percent (*17*). In general the soils support a good growth of red oak, white

[1] By VERNAL C. MILES, woodland specialist, Soil Conservation Service.
[2] Italic numbers in parentheses refer to Literature Cited, p. 14.

TABLE 1.—*Estimated productivity ratings for*

[Productivity indexes in columns A are for common management; ratings in columns B are for improved management. Dashes indicate are suitable only for woodland, wildlife, or

Soil	Corn for grain (100=80 bu. per acre)		Corn for silage (100=12 tons per acre)		Oats (100=50 bu. per acre)	
	A	B	A	B	A	B
Albrights silt loam, 3 to 8 percent slopes	60	120	70	120	70	120
Albrights silt loam, 8 to 15 percent slopes, moderately eroded	45	90	60	90	50	100
Allenwood fine sandy loam, 0 to 5 percent slopes	85	165	85	160	80	130
Allenwood gravelly silt loam, 3 to 8 percent slopes	85	165	85	160	80	130
Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded	75	130	80	125	70	120
Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded	70	110	70	110	65	95
Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded					50	80
Andover gravelly loam, 2 to 8 percent slopes	40	70	50	85	40	70
Andover gravelly loam, 2 to 8 percent slopes, moderately eroded	40	70	50	85	40	70
Andover gravelly loam, 8 to 15 percent slopes, moderately eroded	30	70	40	85	30	70
Andover gravelly loam, 15 to 25 percent slopes, moderately eroded						
Ashton silt loam	100	200	100	200	100	150
Atkins silt loam	40	75	40	75		
Barbour fine sandy loam	90	170	90	170	100	150
Basher fine sandy loam	90	150	100	180	80	120
Basher silt loam	90	160	100	180	80	120
Berks channery silt loam, 3 to 8 percent slopes, moderately eroded	45	70	50	80	60	90
Berks channery silt loam, 8 to 15 percent slopes, moderately eroded	40	60	40	70	45	80
Berks channery silt loam, 15 to 25 percent slopes					40	65
Berks channery silt loam, 15 to 25 percent slopes, moderately eroded					35	60
Berks channery silt loam, 25 to 35 percent slopes						
Berks channery silt loam, 25 to 35 percent slopes, moderately eroded						
Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded	40	70	50	80	50	90
Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded	40	65	45	75	40	80
Berks shaly silt loam, 15 to 25 percent slopes					40	70
Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded					35	60
Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded						
Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded	40	70	40	70	40	70
Berks-Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded						
Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded	40	70	50	85	40	70
Buchanan gravelly loam, 3 to 8 percent slopes	50	100	70	100	60	100
Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded	50	100	70	120	60	100
Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded	45	90	60	90	50	90
Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded	35	70	40	65	40	70
Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded					50	80
Cavode silt loam, 0 to 3 percent slopes	60	100	75	100	80	100
Cavode silt loam, 3 to 8 percent slopes	70	110	80	120	90	110
Chenango gravelly loam, 0 to 3 percent slopes	85	170	90	170	85	140
Chenango gravelly loam, 3 to 8 percent slopes	83	150	83	165	83	135
Comly silt loam, 0 to 3 percent slopes	60	100	70	120	60	100
Comly silt loam, 3 to 8 percent slopes, moderately eroded	60	90	65	120	55	100
Comly silt loam, 8 to 15 percent slopes, moderately eroded	50	90	60	110	50	90
Cookport loam, 0 to 3 percent slopes	50	90	50	90	60	90
Cookport loam, 3 to 8 percent slopes	50	90	50	90	60	90
Cookport loam, 3 to 8 percent slopes, moderately eroded	45	85	45	85	55	85
Cookport loam, 8 to 15 percent slopes	40	80	40	80	50	80
Cookport very stony loam, 0 to 8 percent slopes						
Cookport very stony loam, 8 to 25 percent slopes						
Dekalb channery loam, 0 to 3 percent slopes	50	80	60	90	70	110
Dekalb channery loam, 3 to 8 percent slopes	45	70	50	85	70	100
Dekalb channery loam, 3 to 8 percent slopes, moderately eroded	40	65	45	80	60	90
Dekalb channery loam, 8 to 15 percent slopes	45	70	50	85	70	100
Dekalb channery loam, 8 to 15 percent slopes, moderately eroded	40	60	40	80	50	80
Dekalb channery loam, 15 to 25 percent slopes					55	85
Dekalb very stony soils, 0 to 8 percent slopes						
Dekalb very stony soils, 8 to 25 percent slopes						
Gilpin silt loam, 0 to 3 percent slopes	60	100	60	110	70	120
Gilpin silt loam, 3 to 8 percent slopes	60	100	60	100	70	120
Gilpin silt loam, 8 to 15 percent slopes	50	90	50	90	60	100
Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded	45	85	45	85	40	80
Hagerstown rocky silt loam, 5 to 15 percent slopes					60	100
Hagerstown rocky silt loam, 15 to 25 percent slopes						
Hagerstown silt loam, 0 to 3 percent slopes	95	180	100	180	95	150

See footnote at end of table.

specified crops under two levels of management

that the crop specified is not commonly grown, or that the soil is not suited to it at the specified level of management. Soils that nonagricultural use are not given in the table]

Wheat (100=35 bu. per acre)		Tobacco (100=1,500 lb. per acre)		Potatoes (100=450 bu. per acre)		Hay						Pasture of bluegrass (100=230 cow-acre-days)[1]	
						Alfalfa-grass mixture (100=3 tons per acre)		Clover-grass mixture (100=2 tons per acre)		Birdsfoot trefoil (100=2 tons per acre)			
A	B	A	B	A	B	A	B	A	B	A	B	A	B
60	100			50	80	65	90	60	90	80	90	46	85
50	90			40	70	50	80	50	80	75	95	44	81
80	130	80	130	100	150	90	140	100	140	90	95	50	95
80	130	70	120	85	130	90	100	100	130	80	85	50	95
70	110			65	130	85	135	90	145	65	75	45	93
65	90					70	110	75	120	60	70	40	85
50	85					50	95	40	80	50	60	40	80
								50	75	60	90	28	52
								50	75	60	90	26	42
								40	75	60	90	24	40
								40	70	60	80	24	38
100	150	100	160	100	150	100	150	100	150	90	100	80	100
								40	70	60	90	72	90
100	140	90	140	100	140	90	140	100	150	80	95	60	95
70	100	75	130	75	110	65	110	80	110	90	100	79	95
70	100	75	130	75	110	65	150	90	150	90	100	79	95
60	90	40	70	40	80	50	75	50	80	60	90	41	79
50	80				65	45	70	45	75	60	90	39	75
45	75					40	70	40	70	60	85	40	75
40	70					40	70	40	70	50	80	37	71
												35	70
												30	65
60	80				60	50	75	50	80	50	80	41	79
50	80				50	40	70	45	75	50	80	39	75
50	80					40	70	50	80	50	80	40	75
40	70					40	70	40	70	50	80	37	71
												30	65
40	70					40	70	40	70	50	80	22	44
										40	70	20	40
40	70							50	80	50	80	28	52
50	80			40	70	50	80	50	80	75	100	46	85
60	90			50	80	60	90	60	90	75	85	48	88
50	90			40	70	50	80	50	80	65	75	44	81
40	65					40	70	40	70	60	90	41	71
50	80					50	80	50	80	55	65	38	65
70	100					40	80	30	80	70	100	40	72
80	110					40	85	50	100	70	100	40	72
85	140	80	130	90	150	100	150	100	150	90	95	50	95
83	135	80	130	90	150	100	150	90	150	80	85	50	95
50	80	60	90	70	100	50	80	50	100	70	100	40	72
60	90	60	90	60	90	60	90	60	110	70	100	38	74
60	90					50	80	50	80	70	100	36	72
50	90			60	100	60	80	60	90	70	100	46	85
50	90			60	100	60	80	60	90	70	100	46	85
45	85			55	95	55	80	55	85	65	95	48	88
40	80			50	90	50	80	50	80	60	90	48	88
												40	80
												35	75
60	90			50	100	40	80	40	80	50	85	43	81
60	80			50	100	40	80	40	80	50	85	43	81
50	70			50	90	30	75	30	75	40	85	41	79
60	80			50	90	40	80	40	80	50	85	42	79
40	60			40	80	30	75	30	75	40	85	39	75
45	70						70		70	40	80	37	71
												37	70
												30	65
70	110			70	120	80	100	70	100	80	100	43	81
70	100			70	120	70	90	70	100	80	100	43	81
60	90			60	100	60	80	60	90	70	90	42	79
50	90					50	90	50	90	70	100	34	56
60	100					80	100	80	100	70	90	59	98
												59	95
95	150					100	150	100	150	95	100	60	100

TABLE 1.—*Estimated productivity ratings for*

Soil	Corn for grain (100=80 bu. per acre)		Corn for silage (100=12 tons per acre)		Oats (100=50 bu. per acre)	
	A	B	A	B	A	B
Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded	90	170	100	170	95	150
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded	80	150	90	150	90	150
Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded	75	135	85	145	85	140
Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded	65	120	75	135	75	125
Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded	70	110	75	110	80	110
Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded	60	100	70	90	70	100
Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded	50	90	60	85	60	90
Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded						80
Hartleton channery silt loam, 0 to 3 percent slopes	60	100	60	110	80	120
Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded	55	95	55	100	70	100
Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded	50	90	50	90	50	90
Hartsells channery loam, 0 to 3 percent slopes	85	170	90	170	85	140
Hartsells channery loam, 0 to 3 percent slopes, moderately eroded	80	160	85	160	80	130
Hartsells channery loam, 3 to 8 percent slopes	83	165	83	165	83	135
Hartsells channery loam, 3 to 8 percent slopes, moderately eroded	80	160	85	160	80	130
Hartsells channery loam, 8 to 15 percent slopes, moderately eroded	75	130	80	125	70	120
Hartsells very stony loam, 0 to 8 percent slopes						
Huntington fine sandy loam	90	170	90	170	100	150
Huntington silt loam	100	190	100	190	100	150
Huntington silt loam, local alluvium, 0 to 3 percent slopes	100	190	100	190	100	150
Huntington silt loam, local alluvium, 3 to 8 percent slopes	95	180	95	180	90	140
Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded	80	160	85	160	80	130
Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded	75	130	80	125	70	120
Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded	55	80	65	100	60	90
Laidig very stony loam, 0 to 8 percent slopes						
Laidig very stony loam, 8 to 25 percent slopes						
Leadvale silt loam, 3 to 8 percent slopes	55	100	70	100	60	100
Leadvale silt loam, 8 to 15 percent slopes	50	90	60	90	60	100
Leek Kill channery silt loam, 3 to 8 percent slopes, moderately eroded	60	95	60	100	70	100
Leek Kill channery silt loam, 8 to 15 percent slopes, moderately eroded	50	90	50	90	60	90
Leek Kill channery silt loam, 15 to 25 percent slopes, moderately eroded					50	80
Leek Kill channery silt loam, 25 to 35 percent slopes						
Leek Kill channery silt loam, 25 to 35 percent slopes, moderately eroded						
Lehew very stony loam, 8 to 25 percent slopes						
Lickdale silt loam, 0 to 5 percent slopes						
Lindside silt loam	90	160	100	180	80	120
Meckesville silt loam, 3 to 8 percent slopes, moderately eroded	80	160	85	160	80	130
Meckesville silt loam, 8 to 15 percent slopes, moderately eroded	75	130	80	125	75	120
Meckesville silt loam, 15 to 25 percent slopes, moderately eroded	55	80	65	100	60	90
Melvin and Newark silt loams	45	75	45	75		
Morrison cherty sandy loam, 3 to 8 percent slopes	60	120	60	120	70	120
Murrill gravelly loam, 0 to 3 percent slopes	90	180	100	180	90	140
Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded	85	160	90	160	85	140
Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded	75	130	85	125	80	130
Murrill gravelly loam, 8 to 15 percent slopes, severely eroded	65	100	75	115	70	110
Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded	55	80	65	100	70	110
Murrill very stony loam, 0 to 8 percent slopes						
Murrill very stony loam, 8 to 25 percent slopes						
Nolo silt loam, 0 to 3 percent slopes						
Pope loam, fans, 0 to 3 percent slopes	80	180	100	170	90	140
Pope loam, fans, 3 to 8 percent slopes	75	150	90	160	80	130
Purdy silt loam					40	70
Sequatchie loam	80	170	100	180	100	150
Sequatchie fine sandy loam, high	90	170	100	170	100	150
Tygart silt loam	40	70	40	70	50	80
Ungers loam, 3 to 8 percent slopes	85	165	90	170	85	135
Ungers loam, 3 to 8 percent slopes, moderately eroded	80	160	85	160	80	130
Ungers loam, 8 to 15 percent slopes	75	140	80	140	75	125
Upshur silt loam, acid substratum, 2 to 8 percent slopes	85	160	85	160	85	140
Watson silt loam, 0 to 5 percent slopes	50	80	70	110	55	90
Whitwell silt loam, 0 to 5 percent slopes, moderately eroded	55	110	65	130	65	110
Wiltshire silt loam, 0 to 3 percent slopes	90	160	100	180	90	140
Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded	80	140	80	160	80	120

[1] The number of days per year 1 acre will graze one cow, one horse, or one mule or five sheep or five goats without injury to the pasture.

specified crops under two levels of management—Continued

Wheat (100=35 bu. per acre)		Tobacco (100=1,500 lb. per acre)		Potatoes (100=450 bu. per acre)		Hay						Pasture of bluegrass (100=230 cow-acre-days)[1]	
						Alfalfa-grass mixture (100=3 tons per acre)		Clover-grass mixture (100=2 tons per acre)		Birdsfoot trefoil (100=2 tons per acre)			
A	B	A	B	A	B	A	B	A	B	A	B	A	B
95	150					100	150	100	150	95	100	60	100
95	150					100	150	100	150	75	90	57	98
90	140					100	150	100	150	65	80	56	95
80	125					85	125	85	125	55	70	54	92
80	110					100	140	100	130	75	90	52	88
70	90					90	130	90	120	65	85	49	84
60	80					90	120	80	110	60	80	43	71
	80					80	110	70	100	50	70	40	65
70	110	60	100	70	120	70	100	70	100	80	95	43	81
65	100	50	90	60	110	65	90	65	90	80	95	41	79
60	90	40	80	50	100	60	80	60	80	75	90	39	75
85	140			80	150	100	150	100	155	90	95	50	95
80	130			75	130	90	140	100	150	90	95	50	95
83	135			75	140	95	145	100	155	80	85	50	95
80	130			65	100	90	140	100	150	75	80	48	92
70	110			60	90	85	135	90	145	65	75	42	90
												40	80
100	140	90	140	100	140	100	150	100	150	90	100	60	80
100	150	100	160	100	150	100	150	100	150	90	100	80	100
100	150	100	150	100	150	100	150	100	150	90	100	80	100
90	140	90	140	90	140	90	140	90	140	90	100	80	100
80	130			65	100	90	140	100	150	75	80	48	93
70	110			60	90	85	135	90	145	65	75	45	92
60	90					60	100	60	100	55	65	45	92
												40	80
												40	80
50	80			40	70	50	80	50	80	75	100	46	85
50	80			40	70	50	80	50	80	75	100	48	88
70	100	50	90	60	110	65	90	65	90	75	80	41	79
60	90	40	80	50	100	60	80	60	80	65	75	39	75
60	85					50	75	60	80	60	70	37	71
												37	69
												35	65
												37	70
												28	54
70	100	75	130	75	110	65	150	90	150	90	100	79	95
80	130			65	120	90	140	100	150	75	80	48	93
70	110					85	135	90	145	65	75	45	90
60	90					60	100	60	100	55	65	42	88
								50	90	75	95	72	90
70	120			70	120	70	120	70	120	80	95	45	86
90	140			90	140	100	150	100	150	90	95	50	95
85	140			85	140	100	150	100	150	75	80	48	93
70	110					90	140	90	140	65	75	45	93
60	100					80	110	80	110	60	70	40	85
60	100					80	110	80	110	55	65	42	88
												40	80
												37	80
								40	70	50	100	30	57
90	140	90	140	100	150	95	150	90	140	90	95	80	100
80	130	80	130	100	150	70	120	85	130	80	85	80	100
40	70							50	80	70	90	30	57
100	150	100	160	100	150	80	140	80	140	80	95	60	95
100	140	90	140	100	150	95	140	100	150	90	95	60	95
50	80					40	70	60	90	80	90	40	72
85	135			70	130	95	150	100	150	80	85	50	95
80	130			65	125	90	140	100	150	75	80	48	93
75	125			60	125	90	140	95	150	75	80	48	93
85	140			60	90	90	125	100	150	75	80	50	95
50	80			50	80	50	80	60	90	75	85	46	85
65	110			65	95	60	90	80	110	80	95	60	95
80	110					100	150	100	150	90	95	57	100
80	110					100	150	100	150	90	95	60	98

pine, sugar maple, and tulip-poplar. Trees grow slowly, however, on soils that are shallow and on those that are very poorly drained. Many acres of productive soils are now in woodland made up of red maple, birch, and aspen, but the soils can support white pine and red oak. Also many areas on the high plateaus have a dense growth of slow-growing white oak, but the soils can support white pine, which grows faster.

A landowner can encourage the more desirable trees to grow in his woodland by using good woodland management. The soils and climate are favorable, and help in planning a program of woodland improvement can be obtained from local technicians.

Studies have been made of the rate at which trees grow on several extensive soils in Clinton County.[3] The site index for oak on each of these soils is based on the height attained by the average dominant and codominant (tallest) oak trees at the age of 50 years. Foresters using this index can determine the volume of timber that normal stands can produce at different ages. Results of these studies and of similar studies made in other counties in the State were used in estimating the productivity of the soils, as shown in table 2.

Knowledge of the soil from which the trees and supporting vegetation grow is the place from which to start in managing woodland. The information in table 2, if used by the layman and technician, working as a team, is useful in making some decisions necessary for improvement of the woodland. To help in planning management for woodland in this county, soils that have similar characteristics have been grouped into woodland suitability groups. The soils have been grouped mainly according to similarity in depth, drainage, and parent material. Each group is listed in the table and is also described in the pages that follow.

In table 2 site index ratings are given for each group, and suitable trees are listed by species priority. Names of preferred trees for planting are given, as well as the names of native trees that should be encouraged. Each woodland suitability group has been rated for the various hazards and limitations here described. The degree of rating is shown as *slight*, *moderate*, or *severe*.

Seedling mortality refers to the expected degree of mortality of naturally occurring or planted stock of proper grade that is properly planted. With natural or planted seedlings, normal environmental factors are assumed. The rating arrived at is based on the soil, and all other factors are considered normal or average. Thus, a rating of *slight* indicates that no special problems are recognized. Ordinary losses expected because of soil influence would be no more than 25 percent of the planted stock. Satisfactory restocking by initial planting can be expected, and generally natural regeneration is adequate.

A rating of *moderate* indicates that a moderate problem is recognized. Expected losses because of soil influence would ordinarily be between 25 and 50 percent. Normally some replanting is needed to fill openings. Natural regeneration cannot always be relied upon for adequate and immediate restocking.

A rating of *severe* means that a difficult problem is recognized. Planting losses because of soil influence amount to more than 50 percent and natural regeneration cannot be relied upon. A second or third planting may be needed. Also the seedbed requires special preparation, and careful planting techniques are required.

Plant competition refers to the degree of competition and the rate that undesirable trees, brush, and grasses invade different soils. Generally plant competition is most severe on the productive soils.

Equipment limitations are those soil characteristics and topographic features that restrict or prohibit the use of equipment commonly used in the harvesting, tending, and planting of trees. In this county steep slope, stones, and boulders on the surface of the soils, and prolonged wetness are the principal limitations to the use of equipment.

Erosion hazard refers to the potential hazard of erosion when the soil is managed according to accepted standards.

Windthrow hazard refers to windfirmness as reflected by characteristics of the soils that control the development of the root system of trees. Hard, dense layers, bedrock at a shallow depth, and a prolonged high water table are the main windthrow hazards of soils in this county.

Woodland suitability group 1

In this group (see table 2) are deep, well-drained, nearly level to moderately steep soils. These soils are in uplands, on terraces, and on flood plains. They developed in material from acid sandstone, siltstone, and shale. The following soils are in this group:

Allenwood fine sandy loam, 0 to 5 percent slopes.
Allenwood gravelly silt loam, 3 to 8 percent slopes.
Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded.
Barbour fine sandy loam.
Chenango gravelly loam, 0 to 3 percent slopes.
Chenango gravelly loam, 3 to 8 percent slopes.
Hartsells channery loam, 0 to 3 percent slopes.
Hartsells channery loam, 0 to 3 percent slopes moderately eroded.
Hartsells channery loam, 3 to 8 percent slopes.
Hartsells channery loam, 3 to 8 percent slopes, moderately eroded.
Hartsells channery loam, 8 to 15 percent slopes, moderately eroded.
Hartsells very stony loam, 0 to 8 percent slopes.
Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded.
Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded.
Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded.
Laidig very stony loam, 0 to 8 percent slopes.
Laidig very stony loam, 8 to 25 percent slopes.
Meckesville silt loam, 3 to 8 percent slopes, moderately eroded.
Meckesville silt loam, 8 to 15 percent slopes, moderately eroded.
Meckesville silt loam, 15 to 25 percent slopes, moderately eroded.
Pope loam, fans, 0 to 3 percent slopes.
Pope loam, fans, 3 to 8 percent slopes.
Pope very stony loam.
Sequatchie loam.
Sequatchie fine sandy loam, high.
Ungers loam, 3 to 8 percent slopes.
Ungers loam, 3 to 8 percent slopes, moderately eroded.
Ungers loam, 8 to 15 percent slopes.
Upshur silt loam, acid substratum, 2 to 8 percent slopes.

Limitations to the use of equipment are moderate to severe on the very stony soils and on those soils that have slopes of more than 25 percent.

The hazard of erosion is generally slight on slopes of less than 8 percent and moderate on slopes of more than 8 percent.

[3] Data for the individual sample plots are on file in the State office of the Soil Conservation Service, Harrisburg, Pa.

TABLE 2.—*Soil interpretations for woodland production*

[F–1 soils are excellent for timber; the site index for oak is 75 or better; the expected yield is 13,750 board feet per acre (*9*). F–2 soils are good for timber; the site index for oak is 65 to 74; the expected yield is 9,750 board feet per acre. F–3 soils are fairly good for timber; the site index for oak is 55 to 64; the expected yield is 6,300 board feet per acre. F–4 is poor for timber; the site index for oak is 54 or less; the expected yield is less than 3,250 board feet per acre. Expected yields are for trees at 50 years of age]

Woodland group and mapping symbols	Potential soil productivity for oak	Species priority for—		Seedling mortality	Competition from other plants	Equipment limitations	Hazard of—	
		Native trees	Planted trees				Erosion	Windthrow
Group 1. Deep, well-drained, nearly level to moderately steep soils from acid material (AfA, AgB, AgC2, Ba, ChA, ChB, HrA, HrA2, HrB, HrB2, HrC2, HsB, LaB2, LaC2, LaD2, LdB, LdC, MeB2, MeC2, MeD2, PoA, PoB, Ps, Sa, Sf, UnB, UnB2, UnC, UpB).	F–2	Red oak, tulip-poplar, white pine, ash.	White pine, larch, Austrian pine, Norway spruce.	Slight	Severe	Slight	Slight to moderate.	Slight.
Group 2. Deep, well-drained, nearly level to very steep soils from limestone or from material that contains much lime (As, HaC, HaD, HcE, HeA, HeA2, HeB2, HeC2, HeD2, HgB2, HgC2, Ht, Hu, HvA, HvB, MoB, MuA, MuB2, MuC2, MuD2, MvB, MvC).	F–1	Tulip-poplar, red oak, ash, black walnut.	White pine, Austrian pine, larch, black walnut.	Slight	Severe	Slight	Slight to moderate.	Slight.
Group 3. Deep, well-drained, severely eroded, moderately sloping to moderately steep soils from acid material (AgC3, AgD3).	F–3	White pine, Virginia pine, red oak.	White pine, larch, Austrian pine, Norway spruce.	Slight	Moderate	Slight	Severe	Slight.
Group 4. Deep, well-drained, severely eroded, moderately sloping to moderately steep soils from limestone or from material that contained much lime (HgC3, HgD3, MuC3).	F–1	Tulip-poplar, red oak, ash, black walnut.	White pine, Austrian pine, larch, black walnut.	Slight	Moderate	Slight	Severe	Slight.
Group 5. Moderately deep to shallow, well-drained, nearly level to moderately steep soils from acid sandstone, siltstone, and shale (BeB2, BeC2, BeD, BeD2, BkB2, BkC2, BkD, BkD2, DaA, DaB, DaB2, DaC, DaC2, DaD, DkB, DkC, GpA, GpB, GpC, HhA, HhB2, HhC2, KcD3, LkB2, LkC2, LkD2, LvC).	F–2	Red oak, black oak, white pine; tulip-poplar in coves.	White pine, larch, Austrian pine.	Slight	Moderate	Slight	Slight to moderate.	Slight.
Group 6. Moderately deep to deep, well-drained, nearly level to moderately steep soils from coarse-textured, acid, gray sandstone and conglomerate (LnB, LnC).	F–4	Pitch pine	Pitch pine	Severe	Slight	Moderate	Slight	Slight.
Group 7. Moderately deep, well-drained, steep soils from acid material (BeE, BeE2, BkE2, LkE, LkE2).	F–4	Red oak, chestnut oak, Virginia pine.	White pine, Virginia pine.	Severe	Slight	Severe	Severe	Slight.

TABLE 2.—*Soil interpretations for woodland production*—Continued

Woodland group and mapping symbols	Potential soil productivity for oak	Species priority for—		Seedling mortality	Competition from other plants	Equipment limitations	Hazard of—	
		Native trees	Planted trees				Erosion	Windthrow
Group 8. Moderately deep, well-drained, steep soils from acid material (DkE, KcE3, LvE).	F-4	Red oak, chestnut oak, white pine.	White pine	Moderate	Moderate	Severe	Moderate	Slight.
Group 9. Deep, moderately well drained to somewhat poorly drained, nearly level to moderately steep soils from acid material (AbB, AbC2, AnB, AnB2, AnC2, AnD2, AoB, AoC, Bb, Bc, BuB, BuB2, BuC2, BuC3, BuD2, BvB, BvC, CaA, CaB, CmA, CmB2, CmC2, CoA, CoB, CoB2, CoC, CpB, CpC, LeB, LeC, Ty, WaA, WhA2).	F-2	Red oak, tulip-poplar, white pine, ash, sugar maple.	White pine, larch, Austrian pine, Norway spruce, white spruce.	Slight	Severe	Moderate	Slight	Slight.
Group 10. Deep, moderately well drained to poorly drained, nearly level to gently sloping soils from material that contained much lime (GuB2, Lz, WtA, WtB2).	F-1	Tulip-poplar, red oak, white pine, ash, black walnut.	White pine, Austrian pine, larch.	Slight	Severe	Moderate to severe.	Slight	Slight.
Group 11. Poorly drained to very poorly drained, nearly level to gently sloping soils from acid material and from material that contained much lime (At, BrA2, LwA, Lx, Mn, NoA, NsA, Pu).	F-3	White pine, hemlock, red maple.	White pine, white spruce.	Severe	Moderate	Severe	Slight	Severe.
Group 12. Shallow and very shallow, gently sloping to very steep soils from acid material (BmB3, BmC3, BmD3, BmF, BmF2).	F-4	Virginia pine, chestnut oak.	Virginia pine, white pine.	Severe	Moderate	Moderate to severe.	Severe	Moderate to severe.
Group 13. Gently sloping to very steep areas made up of spoil from strip mining (St).	F-4	Aspen, red maple.	Virginia pine, white pine.	Moderate to severe.	Slight	Moderate to severe.	Moderate to severe.	Slight.
Group 14. Miscellaneous land types (Ma, Ra, Rb, Sn, Sc).	Not suitable for growing trees commercially.							

Woodland suitability group 2

Deep, well-drained, nearly level to very steep soils are in this group (see table 2). These soils are in uplands, on terraces, and on flood plains. They developed in material from limestone or from material that contained much lime. The following soils are in this group:

Ashton silt loam.
Hagerstown rocky silt loam, 5 to 15 percent slopes.
Hagerstown rocky silt loam, 15 to 25 percent slopes.
Hagerstown rocky silty clay loam, 25 to 70 percent slopes.
Hagerstown silt loam, 0 to 3 percent slopes.
Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded.
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded.
Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded.
Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded.
Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded.
Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded.
Huntington fine sandy loam.
Huntington silt loam.
Huntington silt loam, local alluvium, 0 to 3 percent slopes.
Huntington silt loam, local alluvium, 3 to 8 percent slopes.
Morrison cherty sandy loam, 3 to 8 percent slopes.
Murrill gravelly loam, 0 to 3 percent slopes.
Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded.
Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded.
Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded.
Murrill very stony loam, 0 to 8 percent slopes.
Murrill very stony loam, 8 to 25 percent slopes.

Limitations to the use of equipment are moderate to severe on the very stony soils and on those soils that have slopes of more than 25 percent.

Soils in this group that have slopes of more than 8 percent are not so well suited to natural reseeding of black walnut as those that have slopes of less than 8 percent.

The hazard of erosion is moderate on the soils that have slopes of more than 8 percent, but it is slight on those soils that have slopes of less than 8 percent. Huntington silt loam and Huntington fine sandy loam are subject to flooding.

Woodland suitability group 3

In this group (see table 2) are deep, well-drained, severely eroded, moderately sloping to moderately steep soils in uplands. These soils developed in material from acid sandstone, siltstone, and shale. The following soils are in this group:

Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded.
Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded.

Woodland suitability group 4

Deep, well-drained, severely eroded, moderately sloping to moderately steep soils in uplands are in this group (see table 2). These soils developed in material from limestone or from material that contained much lime. The following soils are in this group:

Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded.
Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded.
Murrill gravelly loam, 8 to 15 percent slopes, severely eroded.

Woodland suitability group 5

This group (see table 2) is made up of moderately deep to shallow, well-drained, nearly level to moderately steep soils in uplands. These soils formed in material from acid sandstone, shale, and siltstone. The following soils are in this group:

Berks channery silt loam, 3 to 8 percent slopes, moderately eroded.
Berks channery silt loam, 8 to 15 percent slopes, moderately eroded.
Berks channery silt loam, 15 to 25 percent slopes.
Berks channery silt loam, 15 to 25 percent slopes, moderately eroded.
Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded.
Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded.
Berks shaly silt loam, 15 to 25 percent slopes.
Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded.
Dekalb channery loam, 0 to 3 percent slopes.
Dekalb channery loam, 3 to 8 percent slopes.
Dekalb channery loam, 3 to 8 percent slopes, moderately eroded.
Dekalb channery loam, 8 to 15 percent slopes.
Dekalb channery loam, 8 to 15 percent slopes, moderately eroded.
Dekalb channery loam, 15 to 25 percent slopes.
Dekalb very stony soils, 0 to 8 percent slopes.
Dekalb very stony soils, 8 to 25 percent slopes.
Gilpin silt loam, 0 to 3 percent slopes.
Gilpin silt loam, 3 to 8 percent slopes.
Gilpin silt loam, 8 to 15 percent slopes.
Hartleton channery silt loam, 0 to 3 percent slopes.
Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded.
Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded.
Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded.
Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded.
Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded.
Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded.
Lehew very stony loam, 8 to 25 percent slopes.

Natural reproduction of tulip-poplar should be encouraged only in areas in coves where the soils have slopes of more than 8 percent. Planting of Austrian pine should be done only where the slope is less than 8 percent. The potential productivity of the Dekalb very stony soils and of the Lehew very stony loam in areas on mountain plateaus is poor, but where these soils are at the base of mountains, it is fairly good. Potential productivity of the Dekalb channery loams and of the Berks channery and shaly silt loams is fairly good.

Seedling mortality is moderate for all of the Berks, Dekalb, and Lehew soils. Equipment limitations for the very stony soils in this group is moderate.

The hazard of erosion for all the soils is slight if the slope is less than 8 percent, and moderate if the slope is more than 8 percent.

Woodland suitability group 6

In this group (see table 2) are moderately deep to deep, well-drained, nearly level to moderately steep soils in uplands. These soils developed in material from coarse-textured, acid, gray sandstone. The following soils are in this group:

Leetonia very stony sandy loam, 0 to 8 percent slopes.
Leetonia very stony sandy loam, 8 to 25 percent slopes.

Woodland suitability group 7

The soils in this group (see table 2) are moderately deep, well-drained, and steep and are in uplands. These soils developed in material from acid shale, sandstone, and siltstone. The following soils are in this group:

Berks channery silt loam, 25 to 35 percent slopes.
Berks channery silt loam, 25 to 35 percent slopes, moderately eroded.
Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded.
Leck Kill channery silt loam, 25 to 35 percent slopes.
Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded.

Woodland suitability group 8

Moderately deep, well-drained, and very steep soils in uplands are in this group (see table 2). These soils developed in material from acid sandstone, siltstone, and shale. The following soils are in this group:

Dekalb very stony soils, 25 to 100 percent slopes.
Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded.
Lehew very stony loam, 25 to 100 percent slopes.

Woodland suitability group 9

In this group (see table 2) are deep, moderately well drained to somewhat poorly drained, nearly level to moderately steep soils in uplands and on terraces. These soils developed in material from acid sandstone, siltstone, and shale. The following soils are in this group:

Albrights silt loam, 3 to 8 percent slopes.
Albrights silt loam, 8 to 15 percent slopes, moderately eroded.

Andover gravelly loam, 2 to 8 percent slopes.
Andover gravelly loam, 2 to 8 percent slopes, moderately eroded.
Andover gravelly loam, 8 to 15 percent slopes, moderately eroded.
Andover gravelly loam, 15 to 25 percent slopes, moderately eroded.
Andover very stony loam, 0 to 8 percent slopes.
Andover very stony loam, 8 to 25 percent slopes.
Basher fine sandy loam.
Basher silt loam.
Buchanan gravelly loam, 3 to 8 percent slopes.
Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded.
Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded.
Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded.
Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded.
Buchanan very stony loam, 0 to 8 percent slopes.
Buchanan very stony loam, 8 to 25 percent slopes.
Cavode silt loam, 0 to 3 percent slopes.
Cavode silt loam, 3 to 8 percent slopes.
Comly silt loam, 0 to 3 percent slopes.
Comly silt loam, 3 to 8 percent slopes, moderately eroded.
Comly silt loam, 8 to 15 percent slopes, moderately eroded.
Cookport loam, 0 to 3 percent slopes.
Cookport loam, 3 to 8 percent slopes.
Cookport loam, 3 to 8 percent slopes, moderately eroded.
Cookport loam, 8 to 15 percent slopes.
Cookport very stony loam, 0 to 8 percent slopes.
Cookport very stony loam, 8 to 25 percent slopes.
Leadvale silt loam, 3 to 8 percent slopes.
Leadvale silt loam, 8 to 15 percent slopes.
Tygart silt loam.
Watson silt loam, 0 to 5 percent slopes.
Whitwell silt loam, 0 to 5 percent slopes, moderately eroded.

Natural reproduction of sugar maple should be encouraged only on the soils of this group that have a slope of less than 8 percent. The hazard of windthrow is moderate, rather than slight, for the Andover and Tygart soils.

Woodland suitability group 10

In this group (see table 2) are deep, moderately well drained to poorly drained soils that are nearly level to gently sloping. These soils are in uplands and on flood plains and formed from material that contained much lime. The following soils are in this group:

Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded.
Lindside silt loam.
Wiltshire silt loam, 0 to 3 percent slopes.
Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded.

Woodland suitability group 11

In this group (see table 2) are poorly drained to very poorly drained, nearly level to gently sloping soils in uplands and on terraces and flood plains. Most of these soils developed in material from acid sandstone, shale, and siltstone, but the Melvin and Newark silt loams formed from material that contained much lime. The following soils are in this group:

Atkins silt loam.
Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded.
Lickdale silt loam, 0 to 5 percent slopes.
Lickdale very stony silt loam.
Melvin and Newark silt loams.
Nolo silt loam, 0 to 3 percent slopes.
Nolo very stony silt loam, 0 to 8 percent slopes.
Purdy silt loam.

White spruce is not suitable for planting on Melvin and Newark silt loams. The potential soil productivity of the Lickdale soils is poor, and the soils are not suited for planting trees. Atkins silt loam and Melvin and Newark silt loams are subject to flooding.

Woodland suitability group 12

Shallow and very shallow, gently sloping to very steep soils in uplands are in this group (see table 2). These soils developed in material from shale and thin-bedded sandstone. The following soils are in this group:

Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded.
Berks-Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded.
Berks-Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded.
Berks-Montevallo channery silt loams, 35 to 100 percent slopes.
Berks-Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded.

Equipment limitations are moderate on soils in this group that have a slope of less than 35 percent, and severe, on those that have a slope of more than 35 percent.

Woodland suitability group 13

Strip mines is the only mapping unit in this group (see table 2). It is gently sloping to very steep and consists of soil material from strip mining. The soil material is a mixture of coal, acid sandstone, shale, and siltstone.

Woodland suitability group 14

This group (see table 2) consists of land types that are not suitable for growing trees commercially. The following soils are in this group:

Made land.
Riverwash.
Rubble land.
Stony alluvial land.
Stony land.

Soils and Wildlife[4]

This section discusses the kinds of wildlife in Clinton County and the suitability of the soils for various wildlife habitats. The three major groups of wildlife are—

Openland wildlife. Birds and mammals that commonly frequent cropped fields, meadows, pastures, and areas overgrown with grasses, weeds, and shrubs. Examples are bobwhite quail, ring-necked pheasant, mourning doves, woodcock, cottontail rabbit, meadow larks, killdeer, and field sparrows.

Woodland wildlife. Birds and mammals that commonly frequent wooded areas. Examples are ruffed grouse, wild turkey, deer, squirrel, raccoon, wood thrushes, warblers, and vireos.

Wetland wildlife. Birds and mammals that commonly frequent wet areas such as ponds, marshes, and swamps. Examples are duck, geese, heron, snipe, rail, coot, muskrat, mink, and beaver.

Much of Clinton County is mountainous and thickly forested; only about 11 percent of the acreage is cultivated. As a result, the woodland wildlife species are dominant.

[4] By CLAYTON L. HEINEY, biologist, Soil Conservation Service.

White-tailed deer, bear, wild turkey, ruffed grouse, and gray squirrel are particularly abundant. Ring-necked pheasant, an openland wildlife species, have been established in the southern part of the county. Many fur-bearing animals that normally frequent woodland and wetland are also in the county. Also various kinds of waterfowl and fish are along and in the ponds, lakes, and streams. In addition there are many small animals and other nongame species throughout the area, as well as many kinds of songbirds and other birds. The birds eat weed seeds, insects, and pests that hinder growth of farm crops and are therefore valuable to those who live in the county.

The occurrence and abundance of some kinds of wildlife are related to the kinds of soils. Under natural conditions certain kinds of vegetation grow in various combinations in an area, depending on the distribution of the various kinds of soils. The kind of wildlife in an area depends on the kind of habitat that develops. Wildlife is generally more abundant, the individual animals larger, and the rate of production is higher on the fertile soils than on soils of poor quality. If the habitat is altered by farming, draining of wet areas, or other practices, the vegetation changes and the kind of wildlife also changes.

Wildlife can be encouraged to live in an area if there is a suitable cover of plants, and the vegetation will also help to protect the soils. Generally soils that are fertile and suited to crops, such as those in land capability classes I, II, III, and IV, are not used to produce wildlife. Nevertheless many kinds of wildlife are attracted to areas in crops. Soils that are poorly suited to cultivation, such as those in land capability classes VI, VII, and VIII, provide suitable areas for pasture and trees and also for wildlife. The landowner can obtain information about the kinds of plants that help to encourage wildlife from local soil conservationists and wildlife technicians. The kinds of habitat preferred by the principal kinds of game in the county are discussed in the paragraphs that follow.

White-tailed deer are generally considered to be a forest species, but they neither prefer nor thrive in extensive and mature forests. They generally prefer brushy areas, young stands of trees, and open areas. Deer thrive throughout Clinton County.

Black bear prefer forests that have mixed stands of conifers and hardwoods of various ages. They like the area to have streams, ponds, and lakes that provide plenty of water. Rough terrain is probably not a requirement for bear, but level, fertile soils are likely to be used for agriculture and bear dislike such an environment. Bear particularly shun large, cultivated areas.

Wild turkey are most abundant in the extensively wooded, mountainous areas of the county. They need large areas of forest that produce mast, and they generally will not move into those parts of the county that are agriculturally developed. Nevertheless, because of the terrain of the county and the varied land use, these wily birds are likely to locate anywhere in the county.

Ruffed grouse prefer young, brushy stands of trees and open areas much like those that white-tailed deer frequent.

Gray squirrel generally like wooded areas where there are many oaks and hickories and other trees that bear nuts. They are most abundant in woodland that is interspersed among areas that produce corn, but they generally prefer to live near the edges and openings of woods.

Ring-necked pheasant are fairly numerous in the southern part of the county where the soils are underlain by limestone or limy material. Some of these birds reproduce naturally, but many are raised on the farms and released during the hunting season.

Muskrat, mink, raccoon, fox, and skunk are fairly numerous, but because of the decline in the fur market, these animals are not of as much economic importance as they were formerly.

Trout are abundant in the many cold streams in the county. About 25 streams furnish at least 117 miles of trout fishing for those who like to fish. In addition Bald Eagle Creek and Pine Creek provide warm-water fishing. These creeks furnish about 17 miles of good fishing for smallmouth bass.

The suitability of the soils for various kinds of wildlife varies according to the depth of the soil, its slope, texture, stoniness, and drainage, the depth to the water table, and the moisture-holding capacity. Location and position in the landscape are also important.

Table 3 shows the suitability of the soils in Clinton County for wildlife habitats and for different kinds of wildlife. The ratings indicate only the potential suitability, since changes in land use could alter the site and thus the kinds of wildlife that inhabit an area. The ratings are based on the limitations in properties of the soils for each of eight wildlife habitats defined in the list that follows.

Grain and seed crops. Domestic grains or seed-producing annual herbaceous plants. Examples: Corn, sorghum, wheat, millet, buckwheat, soybeans, and sunflowers.

Grasses and legumes. Domestic perennial grasses and herbaceous legumes that are established by planting. Examples: Fescue, bromegrass, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants. Native or introduced perennial grasses and forbs (weeds) that provide food and cover principally for wildlife in the uplands and are established mainly through natural processes. Examples: Ragweed, wheatgrass, wildrye, oat-grass, pokeweed, strawberry, beggarweed, goldenrod, and dandelion.

Hardwood woodland plants. Deciduous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs, or foliage that are used extensively for food by wildlife and that commonly are established through natural processes but also can be planted. Examples: Oak, beech, cherry, hawthorn, dogwood, viburnum, holly, maple, birch, poplar, grape, honeysuckle, blueberry, brier, greenbrier, raspberry, and rose.

Coniferous woodland plants. Cone-bearing trees and shrubs that are mainly important as cover for wildlife, but they also furnish food as browse, seeds, or fruitlike cones. They are commonly established through natural processes, but they also can be planted. Examples: Pine, spruce, white-cedar, hemlock, fir, redcedar, juniper, and yew.

Wetland food plants. Annual and perennial wild herbaceous plants (exclusive of submerged or floating aquatic plants) in moist to wet sites. The food or cover is used mainly by wetland kinds of wildlife.

TABLE 3.—*Suitability of the soils for wildlife habitats and kinds of wildlife*

[1=well suited; 2=suitable; 3=poorly suited; 4=unsuited]

Soil series and map symbols	Kinds of habitats								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Albrights:											
AbB	2	1	1	1	3	4	4	3	1	1	4
AbC2	2	1	1	1	3	4	4	4	1	1	4
Allenwood:											
AfA, AgB, AgC2	2	1	1	1	3	4	4	4	1	1	4
AgC3	3	2	1	1	3	4	4	4	2	1	4
AgD3	4	3	1	1	3	4	4	4	3	1	4
Andover:											
AnB, AnB2	3	3	2	2	2	3	4	2	3	2	4
AnC2, AnD2	3	3	2	2	2	4	4	4	3	2	4
AoB	4	3	2	2	2	3	3	2	3	2	[2] 3
AoC	4	3	2	2	2	4	4	4	3	2	4
Ashton:											
As	1	1	1	1	3	4	4	4	1	1	4
Atkins:											
At	2	1	1	1	3	3	3	3	1	1	3
Barbour:											
Ba	1	1	1	1	3	4	4	4	1	1	4
Basher:											
Bb, Bc	2	1	1	1	3	3	3	3	1	1	3
Berks:											
BeB2, BeC2	2	2	2	2	2	4	4	4	2	2	4
BeD, BeD2	3	2	2	2	2	4	4	4	2	2	4
BeE, BeE2, BkD, BkD2, BkE2	4	3	2	2	2	4	4	4	3	2	4
BkB2, BkC2	3	3	2	2	2	4	4	4	3	2	4
Berks-Montevallo:											
BmB3	3	3	2	2	2	4	4	4	3	2	4
BmC3, BmD3	4	3	2	2	2	4	4	4	3	2	4
BmF, BmF2	4	4	2	2	2	4	4	4	3	2	4
Brinkerton:											
BrA2	3	2	2	2	2	1	[1] 1	1	2	2	[3] 1
Buchanan:											
BuB, BuB2	2	1	1	1	3	4	4	3	1	1	4
BuC2	2	1	1	1	3	4	4	4	1	1	4
BuC3, BuD2	3	2	1	1	3	4	4	4	2	1	4
BvB	4	3	1	1	2	3	3	3	3	1	4
BvC	4	3	1	1	2	4	4	4	3	1	4
Cavode:											
CaA	2	2	2	2	3	2	2	2	2	2	2
CaB	2	2	2	2	3	3	4	2	2	2	4
Chenango:											
ChA, ChB	1	1	1	1	3	4	4	4	1	1	4
Comly:											
CmA	2	1	1	1	3	3	3	3	1	1	3
CmB2, CmC2	2	1	1	1	3	4	4	3	1	1	4
Cookport:											
CoA	2	1	1	1	3	3	3	3	1	1	3
CoB, CoB2	2	1	1	1	3	4	4	3	1	1	4
CoC	2	1	1	1	3	4	4	4	1	1	4
CpB	4	3	1	1	2	3	[1] 3	3	3	1	4
CpC	4	3	1	1	2	4	4	4	3	1	4

See footnotes at end of table.

TABLE 3.—*Suitability of the soils for wildlife habitats and kinds of wildlife*—Continued

Soil series and map symbols	Kinds of habitats								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Dekalb:											
DaA, DaB, DaB2, DaC, DaC2	2	2	2	2	2	4	4	4	2	2	4
DaD	3	2	2	2	2	4	4	4	2	2	4
DkB, DkC	4	3	2	2	2	4	4	4	3	2	4
DkE	4	4	2	2	2	4	4	4	3	2	4
Gilpin:											
GpA, GpB, GpC	2	2	2	2	2	4	4	4	2	2	4
Guthrie:											
GuB2	3	2	2	2	2	3	4	1	2	2	3
Hagerstown:											
HaC, HeB2, HeC2, HgB2, HgC2	2	1	1	1	3	4	4	4	1	1	4
HaD, HeD2, HgC3	3	2	1	1	3	4	4	4	2	1	4
HcE	4	4	1	1	3	4	4	4	3	1	4
HeA, HeA2	1	1	1	1	3	4	4	4	1	1	4
HgD3	4	3	1	1	3	4	4	4	3	1	4
Hartleton:											
HhA, HhB2, HhC2	2	2	2	2	2	4	4	4	2	2	4
Hartsells:											
HrA, HrA2	1	1	1	1	3	4	4	4	1	1	4
HrB, HrB2, HrC2	2	1	1	1	3	4	4	4	1	1	4
HsB	4	3	1	1	3	4	4	4	3	1	4
Huntington:											
Ht, Hu, HvA, HvB	1	1	1	1	3	4	4	4	1	1	4
Klinesville:											
KcD3, KcE3	4	3	2	2	2	4	4	4	3	2	4
Laidig:											
LaB2, LaC2	2	1	1	1	3	4	4	4	1	1	4
LaD2	3	2	1	1	3	4	4	4	2	1	4
LdB, LdC	4	3	1	1	3	4	4	4	3	1	4
Leadvale:											
LeB	2	1	1	1	3	4	4	3	1	1	4
LeC	2	1	1	1	3	4	4	4	1	1	4
Leck Kill:											
LkB2, LkC2	2	2	2	2	2	4	4	4	2	2	4
LkD2	3	2	2	2	2	4	4	4	2	2	4
LkE, LkE2	4	3	2	2	2	4	4	4	3	2	4
Leetonia:											
LnB, LnC	4	3	2	2	2	4	4	4	3	2	4
Lehew:											
LvC	4	3	2	2	2	4	4	4	3	2	4
LvE	4	4	3	2	1	4	4	4	4	2	4
Lickdale:											
LwA	4	3	3	1	1	1	1	1	3	1	1
Lx	4	3	3	1	1	1	2	2	3	1	1
Lindside:											
Lz	2	1	1	1	3	3	3	3	1	1	3
Made land:											
Ma	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)

See footnotes at end of table.

TABLE 3.—*Suitability of the soils for wildlife habitats and kinds of wildlife*—Continued

Soil series and map symbols	Kinds of habitats								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Meckesville silt loam:											
MeB2, MeC2	2	1	1	1	3	4	4	4	1	1	4
MeD2	3	2	1	1	3	4	4	4	2	1	4
Melvin and Newark:											
Mn	2	1	1	1	3	3	3	3	1	1	3
Morrison:											
MoB	2	1	2	2	3	4	4	4	1	2	4
Murrill:											
MuA	1	1	1	1	3	4	4	4	1	1	4
MuB2, MuC2	2	1	1	1	3	4	4	4	1	1	4
MuC3, MuD2	3	2	1	1	3	4	4	4	2	1	4
MvB, MvC	4	3	1	1	3	4	4	4	3	1	4
Nolo:											
NoA, NsA	3	2	2	2	2	[5] 1	[1] 1	1	2	2	[1] 1
Pope:											
PoA, PoB, Ps	1	1	1	1	3	4	4	4	1	1	4
Purdy:											
Pu	3	2	2	2	2	1	1	1	2	2	1
Riverwash:											
Ra	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
Rubble land:											
Rb	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
Sequatchie:											
Sa, Sf	1	1	1	1	3	4	4	4	1	1	4
Stony alluvial land:											
Sn	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
Stony land:											
So	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
Strip mines:											
St	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
Tygart:											
Ty	2	2	2	2	3	2	2	2	2	2	2
Ungers:											
UnB, UnB2, UnC	2	1	1	1	3	4	4	4	1	1	4
Upshur:											
UpB	2	1	1	1	3	4	4	4	1	1	4
Watson:											
WaA	2	1	1	1	3	[1] 3	[1] 3	3	1	1	[1] 3
Whitwell:											
WhA2	2	1	1	1	3	3	[1] 3	3	1	1	[2] 3
Wiltshire:											
WtA	2	1	1	1	3	3	3	3	1	1	3
WtB2	2	1	1	1	3	4	4	3	1	1	4

[1] Rating is 4 on all slopes of more than 3 percent.
[2] Rating is 4 if rating for shallow water development is 4.
[3] Rating is 2 if rating for shallow water development is 4.
[4] Variable.
[5] Rating is 3 on all slopes of more than 3 percent.

Examples of plants: Smartweed, wild millet, bulrush, sedge, wildrice, switchgrass, reed canarygrass, and cattail.

Shallow water developments. Impoundments, excavated areas, and structures to control the water level at a depth generally not exceeding 5 feet. Examples: Low dikes and levees, shallow dugouts, level ditches, and devices for the control of the water level in marshy streams or channels.

Excavated ponds. Dugout ponds or combinations of dugout ponds and low dikes (dammed areas) that hold enough water of suitable quality and suitable depth to support fish or wildlife. An example is a pond that has at least one-fourth acre surface area and an average depth of 6 feet over at least one-fourth of the area and that has a dependable high water table or other source of unpolluted water of low acidity.

Engineering Uses of the Soils [5]

This soil survey report for Clinton County, Pa., contains information that can be used by engineers to—

1. Make soil and land use studies that will aid in selecting and developing sites for industrial, business, residential, and recreational use.
2. Make estimates of runoff and erosion characteristics for use in designing drainage structures and in planning dams and other structures for soil and water conservation.
3. Aid in determining the suitability of sites for disposal of liquid waste from processing plants and effluent from septic tanks.
4. Estimate the kind of material that will be encountered when excavating for buildings and other structures.
5. Locate probable sources of sand, gravel, and other material for use in construction.
6. Make preliminary surveys of soil and ground conditions that will aid in selecting locations for highways and airports and in planning detailed surveys of the soils at the selected locations.
7. Correlate the performance of pipelines with the type of soil to aid in installing and maintaining the pipelines.
8. Correlate pavement performance with the type of soil and thus develop information that will be useful in designing and maintaining pavements.
9. Determine the suitability of soil units for cross-country movement of vehicles and construction equipment.
10. Supplement the information obtained from other published maps, reports, and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.

Used with the soil map to identify the soils, the engineering interpretations in this section can be useful for many purposes. It should be emphasized that the interpretations may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or where the excavations are deeper than the depths of layers here reported. Nevertheless, even in such situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that can be expected.

Some of the terms used by the soil scientists may be unfamiliar to the engineer, and some words— for example, clay, silt, and sand—may have special meanings in soil science. These and other special terms that are used are defined in the Glossary at the end of the report.

Engineering classification systems

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soil materials are classified in seven principal groups. The groups range from A–1, which consists of gravelly soils of high bearing capacity, to A–7, which consists of clayey soils having low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses, following the soil symbol in table 4.

Some engineers prefer to use the Unified soil classification system (*19*). In this system soil materials are identified as coarse grained, eight classes; fine grained, six classes; or highly organic. The last column of table 4 gives the classification of the tested soils of Clinton County according to the Unified system.

Soil test data

A summary of engineering test data made on the principal soil types of each of several extensive series in Clinton County is given in table 4. The data furnished in this table are the results of tests made by the Pennsylvania State Department of Highways under a cooperative agreement with the U.S. Department of Commerce, Bureau of Public Roads. Tests were done in accordance with standard procedures of the American Association of State Highway Officials.

The engineering classifications in table 4 are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The soil materials tested represent modal conditions and extremes within the named mapping unit.

Table 4 also gives compaction, or moisture-density, data. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork because, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density, when it is at approximately the optimum moisture content.

Mechanical analyses were made by combined sieve and hydrometer methods. Percentages of silt and clay determined by the hydrometer method should not be used in naming textural classes for soil classification. The information, however, is useful in determining general engineering properties of the soils.

[5] By WILLIAM M. FENNELL, engineering specialist, Soil Conservation Service.

TABLE 4.—*Engineering test data for soil samples taken*

[Tests performed by the Pennsylvania Department of Highways under a cooperative agreement with the Bureau of Public

Name of soil and location	Parent material	Pennsylvania report No.	Depth	Horizon	Moisture-density [1]	
					Maximum dry density	Optimum moisture
			Inches		*Lbs. per cu. ft.*	*Percent*
Andover gravelly loam:						
13 miles SW. of Lock Haven and 5 miles E. of Loganton at Carroll on Rt. 880. (Modal profile.)	Colluvium from gray sandstone and shale.	BE-614 [5]	14–21	B2g	123	12
		BE-615 [5]	21–45	B2m	126	10
0.4 mile SW. of Tea Springs on Gasden Hollow road. (Coarser textured than the modal profile.)	Colluvium from gray sandstone.	BE-30872	18–26	B23g	117	14
		BE-30873	32–38	C1	121	12
East end of Sugar Valley.	Colluvium from gray sandstone.	BE-8405	13–20	B2g	103	21
		BE-8406	20–28	B2m	115	14
Ashton silt loam:						
One mile E. of Lock Haven on River Road. (Modal profile.)	Alluvium on terraces.	BE-610	22–34	B21	110	17
		BE-768	54–65	C1	118	12
South edge of Lock Haven Airport. (Finer textured than the modal profile.)	Alluvium on terraces.	BE-8391	20–32	B21	112	16
		BE-8392	56–65	C1	119	12
Southwest corner of Great Island. (Coarser textured than the modal profile.)	Alluvium on terraces.	BE-8393	14–24	B21	103	16
		BE-8394	44–72	C	103	16
Buchanan gravelly loam:						
1½ mile E. of Carroll on the Slim Matthew farm. (Modal profile.)	Colluvium from sandstone and shale.	BE-773	21–27	B22	114	12
		BE-613	41–57	C	118	13
2.5 miles E. of intersection near Tylersville along Rt. 18046. (Finer textured than the modal profile.)	Colluvium from sandstone and shale.	BE-8411	21–27	B22	112	15
		BE-8412	40–60	C1	110	17
200 feet W. of the Clinton and Union County line along the Carroll-White Deer Creek Road. (Coarser textured than the modal profile.)	Colluvium from gray sandstone.	BE-30868	15–22	B22g	116	14
		BE-30869	29–42+	Cg	120	12
Dekalb very stony loam:						
1.2 mile SW. of Riansares Fire Tower. (Modal profile.)	Sandstone (Tuscarora formation).	BE-770 [6]	10–21	B21	120	11
		BE-771 [7]	35–52	C	121	10
1.3 mile S. of Eagleton Field road on Beech Creek road. (Coarser textured than the modal profile.)	Conglomeritic sandstone (Pottsville formation).	BE-8397	13–20	B2	126	9
		BE-8398	25–35	C	123	9
1.4 mile SW. of U.S. Rt. 120 along Eagleton Field road. (Finer textured B horizon than that in the modal profile.)	Sandstone (Pocono formation).	BE-8395	20–30	B22	114	14
		BE-8396	41–52	C2	114	14
Hagerstown silt loam:						
50 feet N. of Rt. 64 and 200 yards E. of the Lutheran Church. (Modal profile.)	Limestone (Trenton formation).	BE-612	21–28	B22	108	14
		BE-772	34–44	B31	102	20
0.3 mile S. of Rt. 18008 on 18044. (Sandier than the modal profile.)	Limestone and chert.	BE-8401	28–37	B22	121	12
		BE-8402	44–55	C1	122	10
Porter Township. (Finer textured than the modal profile.)	Dolomitic limestone.	BE-8399	15–22	B22	98	23
		BE-8400	27–37	B3	97	25
Laidig very stony loam:						
0.6 mile W. of the Clinton and Union County line along the Carroll-White Deer Creek road.	Colluvium from sandstone and shale.	BE-28470	31–43	B2m	123	11
		BE-28471	60–70+	C	122	12
0.4 mile SW. of Tea Springs along the Gasden Hollow road. (Coarser textured than the modal profile.)	Colluvium from sandstone.	BE-30870	11–24	B22	121	12
		BE-30871	36–45+	C	125	10
3 miles E. of Carroll. (Finer textured than the modal profile.)	Colluvium from sandstone	BE-8407	13–20	B22	113	15
		BE-8408	20–32	B2m	106	18

See footnotes at end of table.

from several extensive series, Clinton County, Pa.

Roads (BPR) in accordance with standard procedures of the American Association of State Highway Officials (AASHO)(*1*)]

Mechanical analysis [2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve [3]—						Percentage smaller than [3]—							
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO	Unified [4]
100	99	94	89	85	44	38	28	19	14	21	4	A-4(2)	SM-SC.
100	97	79	71	63	28	24	19	12	9	20	3	A-2-4(0)	SM.
100	97	87	83	80	43	40	31	21	18	28	8	A-4(2)	SC.
100	85	72	60	56	29	27	21	13	10	21	4	A-2-4(0)	SM-SC.
100	93	89	87	85	76	74	58	39	30	36	13	A-6(9)	ML-CL.
100	96	86	81	69	55	53	40	24	17	27	8	A-4(4)	CL.
------	------	------	------	100	85	80	62	38	28	35	14	A-6(10)	CL.
------	------	------	------	100	38	32	23	14	11	21	0	A-4(1)	SM.
------	------	------	------	100	79	70	51	34	27	33	10	A-4(8)	ML-CL.
------	------	------	100	99	37	28	18	13	11	20	1	A-4(0)	SM.
------	------	------	100	98	13	10	7	5	3	24	0	A-2-4(0)	SM.
------	------	------	------	100	15	11	6	5	3	21	0	A-2-4(0)	SM.
100	97	89	76	64	50	48	38	23	18	28	7	A-4(3)	SM-SC.
100	87	78	65	54	36	34	25	17	12	26	6	A-4(0)	SM-SC.
100	92	86	84	81	63	61	49	32	24	31	11	A-6(6)	CL.
100	97	94	93	91	79	77	61	41	30	35	12	A-6(9)	ML-CL.
100	92	82	78	76	43	38	27	14	10	22	2	A-4(2)	SM.
100	77	68	65	63	31	27	20	11	7	20	2	A-2-4(0)	SM.
100	72	61	58	54	25	22	16	10	8	19	1	A-2-4(0)	GM.
100	65	50	47	44	18	16	11	7	5	18	1	A-1-b(0)	GM.
100	98	95	89	71	38	35	29	17	12	18	3	A-4(1)	SM.
100	86	79	77	69	27	23	17	12	9	16	0	A-2-4(0)	SM.
------	100	99	99	96	65	63	52	31	23	27	7	A-4(6)	ML-CL.
100	90	81	80	78	56	54	44	27	19	28	8	A-4(4)	CL.
------	100	98	97	94	90	87	74	46	36	36	16	A-6(10)	CL.
------	100	98	97	95	93	90	74	59	52	42	20	A-7-6(12)	CL.
100	94	83	81	72	51	49	37	27	23	24	9	A-4(3)	CL.
100	90	80	76	66	45	43	33	18	14	20	3	A-4(2)	SM.
------	100	99	98	96	94	92	82	68	62	51	26	A-7-6(17)	CH.
------	------	100	99	97	94	92	85	74	66	53	28	A-7-6(18)	CH.
100	65	53	49	45	23	20	13	7	6	20	2	A-1-b(0)	GM.
100	83	70	65	59	34	30	21	13	9	20	3	A-2-4(0)	SM.
100	66	48	44	40	21	19	15	10	7	22	3	A-1-b(0)	GM.
100	69	45	40	37	15	13	10	5	4	19	1	A-1-b(0)	GM.
100	94	81	70	60	47	44	35	25	18	30	8	A-4(2)	SM-SC.
100	85	56	46	37	32	31	25	20	15	39	11	A-2-6(0)	GM.

TABLE 4.—*Engineering test data for soil samples taken*

Name of soil and location	Parent material	Pennsylvania report No.	Depth	Horizon	Moisture-density [1]	
					Maximum dry density	Optimum moisture
			Inches		*Lbs. per cu. ft.*	*Percent*
Meckesville silt loam:						
6.7 miles W. and 1 mile N. of Lock Haven on U.S. Rt. 120. (Modal profile.)	Colluvium from red siltstone, sandstone, and shale.	BE-5807	23–29	B22	115	15
		BE-5808	38–47	C1	112	16
3 miles N. of Lock Haven on U.S. Rt. 120. (Coarser textured than the modal profile.)	Colluvium from red sandstone.	BE-8403	27–37	B22	113	15
		BE-8404	37–60	C1	120	13
0.5 mile NE. of Woolrich. (Contains more sand and gravel than the *modal* profile.)	Colluvium from red shale and sandstone.	BE-30864	33–50	B23	122	13
		BE-30865	50–80 +	C1	120	12
Murrill gravelly loam:						
300 feet S. and 210 feet W. of intersection of road at Tylersville.	Colluvium over limestone.	BE-27785	21–35	B22	104	21
		BE-28472	62–68	C	108	17
380 feet NE. of State Rt. 780 on Rt. T349. (Finer textured than the modal profile.)	Colluvium over limestone.	BE-30866	37–50	B23	114	15
		BE-30867	63–75	C1	105	16
1 mile E. of Tylersville on Rt. 18027. (Coarser textured than the modal profile.)	Colluvium over limestone.	BE-2450	16–24	B22	112	16
		BE-2451	32–42	C	111	16
Wiltshire silt loam:						
2.25 miles SE. of Salona. (Modal profile.)	Colluvium.	BE-760	15–23	B22	105	16
		BE-611	53–61	C1	116	15
Porter Township. On county road No. 18044. (Coarser textured than the modal profile.)	Colluvium.	BE-8409	26–36	B2	124	10
		BE-8410	36–43	B2m	124	11
1.5 mile NE. of Lamar on Rt. T324. (Finer textured than the modal profile.)	Colluvium.	BE-2449	34–40	B22	111	16
		BE-2448	48–60	C1	115	15

[1] Based on AASHO Designation: T 99–57, Method A. (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in naming textural classes for soils.

The tests for liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from the plastic to a liquid state. The *plastic limit* is the moisture content, on a dry basis, at which the soil material passes from a semisolid to a plastic state. The *liquid limit* is the moisture content at which the material passes from a plastic to a liquid state. The *plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Engineering properties and interpretations

The properties of the soils and the interpretations that are the most significant to engineers are given in tables 5 and 6. Additional information helpful to engineers can be obtained from the detailed soil map and the general soil map. For some information, however, it may be necessary to refer to other parts of the report, particularly the section "Descriptions of the Soils."

The descriptions of the soil profiles, as well as the soil maps, should be used in planning detailed surveys at construction sites. These will help the engineer to concentrate on the most suitable soils, indicate sources of sand and gravel, and minimize the number of soil samples needed for testing in the laboratory.

Table 5 gives a brief description of the soils of Clinton County and their estimated physical properties. The properties are those of the average soil profiles, which are divided into layers significant to engineering. Where test data are available, the average values from table 4 are shown. Where tests were not performed, the estimates shown are based on test data obtained from similar soils in this county or test data obtained for these soils from other counties and by past experience in engineering construction. Since the estimates are only for the average soils, considerable variation from these values should be antici-

from several extensive series, Clinton County, Pa.—Continued

Mechanical analysis [2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve [3]—						Percentage smaller than [3]—							
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO	Unified [4]
100	91	84	82	80	66	62	48	32	24	31	10	A-4(6)	ML-CL.
100	96	94	93	91	77	74	57	37	28	29	10	A-4(8)	CL.
100	73	63	60	59	53	50	36	22	18	31	10	A-4(4)	ML-CL.
100	80	64	58	53	45	42	30	19	14	28	9	A-4(2)	GC.
100	87	74	66	53	38	34	24	14	9	23	4	A-4(1)	SM-SC.
100	90	65	55	46	39	37	27	16	11	28	7	A-4(1)	GM-GC.
------	100	99	98	88	79	77	65	46	40	41	16	A-7-6(11)	ML-CL.
100	83	78	76	71	56	54	45	34	29	41	16	A-7-6(7)	ML-CL.
100	89	80	75	66	52	49	42	27	21	27	8	A-4(3)	CL.
100	95	89	82	71	59	57	48	37	32	38	17	A-6(8)	CL.
100	69	62	57	49	39	37	29	21	17	34	10	A-4(1)	GM-GC.
100	79	72	64	54	42	40	31	22	18	35	13	A-6(2)	SM-SC.
------	------	------	100	99	85	82	66	47	38	37	15	A-6(10)	CL.
------	100	99	93	79	65	63	48	31	22	28	10	A-4(6)	CL.
100	88	75	71	59	34	32	27	17	10	20	4	A-2-4(0)	SM-SC.
100	86	73	68	55	35	33	27	17	13	22	7	A-2-4(0)	SM-SC.
------	100	97	95	89	81	78	60	36	30	34	5	A-4(8)	ML.
------	100	89	81	65	54	50	38	25	21	32	13	A-6(5)	CL.

[3] Based on sample received in laboratory. Laboratory test data not corrected for amount discarded in field sampling.
[4] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are GM–GC, SM–SC, and ML–CL.
[5] One percent of material larger than 3 inches estimated to have been discarded in field sampling.
[6] Thirty-five percent of material larger than 3 inches estimated to have been discarded in field sampling.
[7] Sixty-five percent of material larger than 3 inches estimated to have been discarded in field sampling.

pated. More information on the range of properties of the soils can be obtained in other sections of the report.

The map symbols and the names of the soils are listed alphabetically in table 5, and depth to a seasonally high water table and to bedrock is shown. In the column that shows depth from surface, the layers indicated are fairly typical of the layers in all the soils of any one series. The depths indicated, however, are not identical with those in the representative profile for that particular series, given in the section "Descriptions of the Soils."

The engineering soil classifications given in table 5 are based on the soil material below a depth of 3 to 16 inches.

The available moisture capacity, given in inches per inch of soil depth, is the approximate amount of capillary water in the soil when it is wet to field capacity. When the soil is air dry, this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation.

Shrink-swell potential is an indication of the volume change to be expected with a change in moisture content. It is estimated primarily on the basis of the amount and type of clay present. In general, soils classified as CH and A–7 have high shrink-swell potential. Clean sand and gravel (single-grain structure) and those soils that contain small amounts of nonplastic to slightly plastic fines, as well as most other nonplastic to slightly plastic soil materials, have low shrink-swell potential.

In table 6 the soils of the county are rated as to their suitability for engineering work, and features of the soils that affect engineering practices are given. The ratings are based on research and on the judgment of engineers and soil scientists who have had experience with similar soils in other counties.

The suitability of the soils as sources of borrow material for such uses as topsoil, sand and gravel, and road fill depends partly on the position of the water table and the drainage of the soils. Poorly drained and very poorly drained soils occur on the floors of valleys and also in the uplands. The soil material in some of these areas contains too much organic matter to be suitable for use in

TABLE 5.—*Brief description of the soils of Clinton*

Map symbol	Soil	Depth to seasonally high water table	Depth to bedrock	Brief description of soil	Depth from surface (typical profile)
		Feet	*Feet*		*Inches*
AbB	Albrights silt loam, 3 to 8 percent slopes.	3	5–8	Moderately well drained silt loams that are 3 to 4 or more feet thick; developed on material weathered from red sandstone, siltstone, and shale.	0–10
AbC2	Albrights silt loam, 8 to 15 percent slopes, moderately eroded.				10–39
					39–45
AfA	Allenwood fine sandy loam, 0 to 5 percent slopes.	3+	3–10	Well-drained fine sandy loams and gravelly silt loams that are 3 to 5 or more feet thick and are in the uplands; developed on material weathered from red sandstone, siltstone, and shale.	0–8
AgB	Allenwood gravelly silt loam, 3 to 8 percent slopes.				8–29
AgC2	Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded.				29–48
AgC3	Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded.				
AgD3	Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded.				
AnB	Andover gravelly loam, 2 to 8 percent slopes.	0	4–20	Poorly drained to very poorly drained gravelly loams and very stony loams that are 3 to 5 or more feet thick; developed in colluvium derived from gray and red sandstone.	0–8
AnB2	Andover gravelly loam, 2 to 8 percent slopes, moderately eroded.				8–27
AnC2	Andover gravelly loam, 8 to 15 percent slopes, moderately eroded.				27–60
AnD2	Andover gravelly loam, 15 to 25 percent slopes, moderately eroded.				
AoB	Andover very stony loam, 0 to 8 percent slopes.				
AoC	Andover very stony loam, 8 to 25 percent slopes.				
As	Ashton silt loam.	3	8–30	Well-drained silt loam that is 3 to 10 or more feet thick; developed in alluvium on low stream terraces; seldom flooded.	0–14
					14–54
					54–72
At	Atkins silt loam.	0	4–10	Poorly drained silt loam that is 3 or more feet thick; developed in alluvium; subject to flooding.	0–9
					9–14
					14–48
Ba	Barbour fine sandy loam.	3	4–20	Well-drained fine sandy loam, loam, or very stony loam that is 3 to 6 or more feet thick; developed in alluvium derived from sandstone, shale, and siltstone; subject to flooding.	0–13
					13–36
					36–48
Bb	Basher fine sandy loam.	1½	4–10	Moderately well drained to somewhat poorly drained fine sandy loam or silt loam that is 3 to 6 or more feet thick and developed in alluvium; subject to flooding.	0–16
Bc	Basher silt loam.				16–35
					35–48
BeB2	Berks channery silt loam, 3 to 8 percent slopes, moderately eroded.	3	2–4	Well-drained silt loams and channery silt loams that are 1 to 2 or more feet thick and developed in soil material derived mainly from brown shaly siltstone but that included some sandstone; the shale is hard.	0–10
BeC2	Berks channery silt loam, 8 to 15 percent slopes, moderately eroded.				10–23
BeD	Berks channery silt loam, 15 to 25 percent slopes.				23–36
BeD2	Berks channery silt loam, 15 to 25 percent slopes, moderately eroded.				
BeE	Berks channery silt loam, 25 to 35 percent slopes.				
BeE2	Berks channery silt loam, 25 to 35 percent slopes, moderately eroded.				
BkB2	Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded.	3+	1½–4	Well-drained channery silt loams and shaly silt loams that are 1½ to 3 or more feet thick and developed on soil material from soft brown shale.	0–8
BkC2	Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded.				8–24
BkD	Berks shaly silt loam, 15 to 25 percent slopes.				24–36
BkD2	Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded.				
BkE2	Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded.				

See footnotes at end of table.

County, Pa., and their estimated physical properties

Classification		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*	
ML, SM	A-4	70-95	70-90	40-80	2.0-6.3	0.20	5.0			
SM	A-4, A-2	70-90	60-85	25-45	0.63-2.0	.14	5.0	15	115	Low.
					0.63-2.0	.10	5.0	12	118	Low.
GM, GC, SM	A-4, A-2	60-75	55-70	30-45	2.0-6.3	.30	5.8			
SM, GM	A-2	60-80	55-75	20-40	0.63-2.0	.26	5.2	15	112	Low.
					0.63-2.0	.26	5.1	16	112	Low.
SM, SC, CL	A-4, A-6	80-95	80-90	45-75	2.0-6.3	.24	6.6			
SM, SC	A-2, A-4	80-95	60-80	30-50	0.2-0.63	.16	6.0	15	110	Low.
					<0.2	.10	5.5	11	120	Low.
ML, CL	A-4, A-6	95-100	95-100	80-85	2.0-6.3	.23	6.6			
SM	A-2, A-4	95-100	95-100	20-40	0.63-2.0	.17	6.2	15	110	Low.
					0.63-2.0	.15	5.8	12	115	Low.
CL, ML	A-4, A-6	95-100	95-100	65-85	0.63-2.0	.25	6.2			
CL, ML	A-4, A-6	90-100	85-100	60-80	0.2-0.63	.15	5.8	15	115	Low.
					0.2-0.63	.10	5.2	17	115	Low.
CL, ML	A-4, A-6	95-100	95-100	55-85	2.0-6.3	.17	6.3			
GP, GM, ML	A-2, A-4	55-100	40-100	15-80	0.63-2.0	.17	5.2	14	112	Low.
					0.63-2.0	.10	5.2	12	116	Low.
SM, ML	A-4	95-100	95-100	40-80	2.0-6.3	.15	6.2			
SM, ML	A-4	95-100	90-100	40-90	2.0-6.3	.15	5.2	13	106	Low.
					0.2-0.63	.15	5.0	13	106	Low.
SM, GM	A-1, A-4	50-65	40-55	25-40	2.0-6.3	.15	5.0			
GW-GM	A-1, A-2	25-55	20-40	10-30	2.0-6.3	.10	5.2	15	112	Low.
					2.0-6.3	.05	5.2	17	110	Low.
SM	A-2, A-4	65-85	60-80	25-40	2.0-6.3	.16	6.0			
GW, GM	A-1, A-2	40-60	35-55	20-30	2.0-6.3	.13	6.4	15	110	Low.
					2.0-6.3	.07	6.5	15	108	Low.

TABLE 5.—*Brief description of the soils of Clinton County,*

Map symbol	Soil	Depth to seasonally high water table	Depth to bedrock	Brief description of soil	Depth from surface (typical profile)
		Feet	*Feet*		*Inches*
BmB3	Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded.	3+	1–2	Well-drained, shallow channery silt loams that are 1 to 2 or more feet thick and developed on hard, shaly material. (Interpretations are for the Montevallo member of the complex. See Berks channery silt loam interpretations for the Berks member of the complex.)	0–4
BmC3	Berks-Montevallo channery silt loam, 8 to 15 percent slopes, severely eroded.				4–12
BmD3	Berks-Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded.				12–24
BmF	Berks-Montevallo channery silt loams, 35 to 100 percent slopes.				
BmF2	Berks-Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded.				
BrA2	Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded.	0	3–20	Poorly drained silt loam that is 3 to 5 or more feet thick and has a weak fragipan; developed in upland areas on material from siltstone, shale, and sandstone.	0–9
					9–20
					20–36
BuB	Buchanan gravelly loam, 3 to 8 percent slopes.	1–1½	4–30	Moderately well drained to somewhat poorly drained gravelly or very stony loams that are 4 or more feet thick and have a fragipan; developed on the lower part of slopes in material derived from sandstone, siltstone, and shale; pebbles, cobblestones, and larger stones are scattered throughout the profile.	0–10
BuB2	Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded.				10–36
BuC2	Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded.				36–47
BuC3	Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded.				
BuD2	Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded.				
BvB	Buchanan very stony loam, 0 to 8 percent slopes.				
BvC	Buchanan very stony loam, 8 to 25 percent slopes.				
CaA	Cavode silt loam, 0 to 3 percent slopes.	1	3–6	Somewhat poorly drained to poorly drained silt loams and clays that are 3 to 4 or more feet thick and are in the uplands; developed in material mainly from gray shale and siltstone but includes some sandstone.	0–8
CaB	Cavode silt loam, 3 to 8 percent slopes.				8–36
					36–52
ChA	Chenango gravelly loam, 0 to 3 percent slopes.	4+	4–15	Well-drained gravelly loams that are 4 feet or more thick and are on alluvial terraces that are above overflow; developed on glacial outwash derived from sandstone, siltstone, and shale.	0–16
ChB	Chenango gravelly loam, 3 to 8 percent slopes.				16–36
					36–120
CmA	Comly silt loam, 0 to 3 percent slopes.	1½	2–6	Moderately well drained to somewhat poorly drained silt loams that are 2 to 3 or more feet thick and are on the lower part of slopes in the uplands; developed on glacial till derived from shale and siltstone.	0–9
CmB2	Comly silt loam, 3 to 8 percent slopes, moderately eroded.				9–38
CmC2	Comly silt loam, 8 to 15 percent slopes, moderately eroded.				38–72
CoA	Cookport loam, 0 to 3 percent slopes.	1½	3–6	Moderately well drained loams and very stony loams that are 3 to 4 feet or more thick and are in the uplands; developed on material derived from sandstone, siltstone, and shale; stones 1 to 5 feet in diameter are on the surface and throughout the profile.	0–8
CoB	Cookport loam, 3 to 8 percent slopes.				8–22
CoB2	Cookport loam, 3 to 8 percent slopes, moderately eroded.				22–40
CoC	Cookport loam, 8 to 15 percent slopes.				
CpB	Cookport very stony loam, 0 to 8 percent slopes.				
CpC	Cookport very stony loam, 8 to 25 percent slopes.				
DaA	Dekalb channery loam, 0 to 3 percent slopes.	3+	2–3½	Well-drained channery loams that are 2 to 3 feet thick; developed from material derived mainly from sandstone and conglomerate but includes some shale; stones and boulders 10 inches to 10 feet in diameter are on the surface and throughout the substratum.	0–7
DaB	Dekalb channery loam, 3 to 8 percent slopes.				7–28
DaB2	Dekalb channery loam, 3 to 8 percent slopes, moderately eroded.				28–38
DaC	Dekalb channery loam, 8 to 15 percent slopes.				
DaC2	Dekalb channery loam, 8 to 15 percent slopes, moderately eroded.				
DaD	Dekalb channery loam, 15 to 25 percent slopes.				
DkB	Dekalb very stony soils, 0 to 8 percent slopes.				
DkC	Dekalb very stony soils, 8 to 25 percent slopes.				
DkE	Dekalb very stony soils, 25 to 100 percent slopes.				

See footnotes at end of table.

Pa., and their estimated physical properties—Continued

Classification		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*	
					2.0–6.3	<.13	6.0			
GM	A-1, A-2	35–55	20–40	10–20	2.0–6.3	<.08	5.8	15	110	Low.
GW-GM	A-1, A-2	25–45	15–30	5–10	2.0–6.3	<.05	5.8	15	108	Low.
					0.63–2.0	.23	5.6			
ML-CL	A-4, A-6	80–100	70–100	55–75	0.2–0.63	.18	4.4	18	108	Low.
ML-CL	A-4	70–90	70–90	55–70	<0.2	.16	4.6	15	111	Low.
					2.0–6.3	.16	7.0			
SM-SC, ML	A-4, A-6	80–90	75–85	40–55	0.63–2.0	.12	5.6	15	115	Low.
SM-SC, SM	A-4, A-6	70–80	65–75	40–50	0.2–0.63	.10	5.0	16	118	Low.
					0.63–2.0	.20	5.8			
ML-CL, ML	A-4, A-7	80–100	80–100	60–80	0.2–0.63	.14	4.8	15	105	Medium.
CL	A-4, A-6	60–80	60–80	55–70	0.2–0.63	.18	4.8	15	105	Medium.
					>6.3	.15	5.6			
GM or GW-GM	A-1	30–50	25–45	10–25	2.0–6.3	.10	5.4	10	125	Low.
GM or GW-GM	A-1	25–45	15–35	5–15	>6.3	.05	5.4	9	128	Low.
					2.0–6.3	.22	7.0			
ML-CL, ML	A-4	80–95	65–85	60–80	0.63–2.0	.15	5.8	16	115	Low.
GM-GC, GM	A-1, A-2	35–55	30–50	20–40	0.2–0.63	.10	4.8	15	113	Low.
					0.63–2.0	.18	5.0			
SC-SM	A-4	75–90	70–85	40–50	0.2–0.63	.14	5.2	14	115	Low.
SC-SM, GM-GC	A-2, A-4	60–80	60–80	30–50	0.2–0.63	.12	5.2	12	118	Low.
					2.0–6.3	.14	4.9			
SM-SC, GM	A-2, A-4	60–90	60–80	20–35	2.0–6.3	.12	4.8	11	118	Low.
SM, GM	A-1, A-2	50–70	50–70	10–30	2.0–6.3	.08	5.0	10	120	Low.

TABLE 5.—*Brief description of the soils of Clinton County,*

Map symbol	Soil	Depth to seasonally high water table	Depth to bedrock	Brief description of soil	Depth from surface (typical profile)
		Feet	*Feet*		*Inches*
GpA	Gilpin silt loam, 0 to 3 percent slopes.	4+	2–5	Well-drained silt loams that are 2 to 3 feet thick; developed on material weathered from moderately hard shale and siltstone.	0–3
GpB	Gilpin silt loam, 3 to 8 percent slopes.				3–23
GpC	Gilpin silt loam, 8 to 15 percent slopes.				23–30
GuB2	Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded.	0–½	3–8	Somewhat poorly drained silt loam that is 3 to 4 feet thick and is in depressions and seeps; developed on limestone or on soil material that contained lime.	0–8 8–35 35–48
HaC	Hagerstown rocky silt loam, 5 to 15 percent slopes.	6+	3–6	Well-drained silt loams, silty clay loams, and rocky silt loams that are 3 to 4 or more feet thick; developed on soil material derived from hard gray dolomite and limestone.	0–6 6–28 28–54
HaD	Hagerstown rocky silt loam, 15 to 25 percent slopes.				
HcE	Hagerstown rocky silty clay loam, 25 to 70 percent slopes.				
HeA	Hagerstown silt loam, 0 to 3 percent slopes.				
HeA2	Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded.				
HeB2	Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded.				
HeC2	Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded.				
HeD2	Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded.				
HgB2	Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded.				
HgC2	Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded.				
HgC3	Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded.				
HgD3	Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded.				
HhA	Hartleton channery silt loam, 0 to 3 percent slopes.	4+	4–8	Well-drained channery silt loams or loams that are 3 to 4 or more feet thick; developed on glacial till derived mainly from acid shale and siltstone but that included some sandstone; small to moderate amounts of channery fragments are on the surface and throughout the profile.	0–7 7–28 28–45
HhB2	Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded.				
HhC2	Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded.				
HrA	Hartsells channery loam, 0 to 3 percent slopes.	3	4–8	Well-drained channery loams and very stony loams that are 3 to 4 or more feet thick; developed on material weathered from gray sandstone, siltstone, and shale; stones 1 to 5 feet in diameter are on the surface and throughout the profile.	0–13 13–32 32–46
HrA2	Hartsells channery loam, 0 to 3 percent slopes, moderately eroded.				
HrB	Hartsells channery loam, 3 to 8 percent slopes.				
HrB2	Hartsells channery loam, 3 to 8 percent slopes, moderately eroded.				
HrC2	Hartsells channery loam, 8 to 15 percent slopes, moderately eroded.				
HsB	Hartsells very stony loam, 0 to 8 percent slopes.				
Ht	Huntington fine sandy loam.	3+	4–20	Well-drained silt loam or sandy loam more than 3 feet thick on flood plains of larger streams; areas are subject to deposition or erosion from frequent overflow.	0–10 10–36 36–52
Hu	Huntington silt loam.				
HvA	Huntington silt loam, local alluvium, 0 to 3 percent slopes.				
HvB	Huntington silt loam, local alluvium, 3 to 8 percent slopes.				
KcD3	Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded.	3+	½–2	Well-drained channery silt loams that are ½ to 1½ feet thick; developed on glaciated uplands underlain by red siltstone, sandstone, and shale.	0–4 4–12 12–19
KcE3	Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded.				

See footnotes at end of table.

Pa., and their estimated physical properties—Continued

Classification		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*	
SM, GM	A-2, A-4	50-70	40-60	20-50	2.0-6.3 0.63-2.0	.16 .12	5.2 5.2	14	115	Low.
GM-GC	A-2	25-45	20-40	15-30	0.63-2.0	.12	5.2	14	115	Low.
CL	A-6	90-100	75-95	70-90	0.63-2.0 0.2-0.63	.19 .12	6.8 6.5	15	110	Medium.
CL	A-6	80-100	65-85	60-80	0.2-0.63	.10	5.8	20	110	Medium.
CL	A-6	80-100	80-100	70-90	2.0-6.3 0.63-2.0	.22 .12	6.6 6.6	18	108	Medium.
CL	A-7	80-100	75-95	70-90	0.63-2.0	.12	6.4	20	102	Medium.
GM, ML	A-4	45-65	40-60	35-55	2.0-6.3 0.63-2.0	.14 .09	5.6 5.2	13	119	Low.
GM, GC	A-2, A-4	40-60	35-55	25-45	0.63-2.0	.07	5.5	13	119	Low.
GM-GC, SM-SC	A-2 A-4	60-70	50-65	30-50	2.0-6.3 0.63-2.0	.15 .10	5.6 4.8	14	112	Low.
SC, GM-SM	A-1, A-2	60-80	25-45	10-20	0.63-2.0	.06	5.0	12	112	Low.
ML, SM, SC	A-4	90-100	80-90	35-55	2.0-6.3 2.0-6.3	.22 .15	7.2 6.8	14	120	Low.
SM, SC	A-2	85-95	60-80	10-30	2.0-6.3	.18	6.8	14	120	Low.
GM, GC	A-2	30-60	25-50	20-35	2.0-6.3 2.0-6.3	.14 .10	6.0 5.6	14	120	Low.
GM, GP-GM	A-1, A-2	15-55	10-45	5-30	2.0-6.3	.06	5.6	12	118	Low.

TABLE 5.—*Brief description of the soils of Clinton County,*

Map symbol	Soil	Depth to seasonally high water table	Depth to bedrock	Brief description of soil	Depth from surface (typical profile)
		Feet	*Feet*		*Inches*
LaB2	Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded.	3+	4–30	Well-drained gravelly and very stony loams that are 4 or more feet thick; developed on colluvium from mixed red and gray sandstone, shale, and siltstone; cobblestones and larger stones are throughout the profile of all the soils and also are on the surface of the very stony loams.	0–10 10–43 43–72
LaC2	Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded.				
LaD2	Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded.				
LdB	Laidig very stony loam, 0 to 8 percent slopes.				
LdC	Laidig very stony loam, 8 to 25 percent slopes.				
LeB	Leadvale silt loam, 3 to 8 percent slopes.	1½–4	6–20	Moderately well drained silt loams that are 6 or more feet thick; developed on colluvium from acid shale, siltstone, and sandstone.	0–11 11–30 30–84
LeC	Leadvale silt loam, 8 to 15 percent slopes.				
LkB2	Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded.	36+	2–3	Well-drained channery silt loams that are 1½ to 3 feet thick and are in glaciated uplands; underlain by red siltstone, sandstone, and shale.	0–7 7–24 24–36
LkC2	Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded.				
LkD2	Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded.				
LkE	Leck Kill channery silt loam, 25 to 35 percent slopes.				
LkE2	Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded.				
LnB	Lectonia very stony sandy loam, 0 to 8 percent slopes.	4+	2–4	Well-drained very stony sandy loams that are 2 to 4 feet thick and are in the uplands; developed in material derived from coarse sandstone and conglomerate; stones and boulders 10 inches to 4 feet in diameter are scattered over the surface and throughout profile.	0–10 10–24 24–34
LnC	Lectonia very stony sandy loam, 8 to 25 percent slopes.				
LvC	Lehew very stony loam, 8 to 25 percent slopes.	2+	2–3	Well-drained very stony loams that are 2 to 3 feet thick; developed from material derived from sandstone; stones and boulders 10 inches to 4 feet in diameter are scattered over the surface and throughout the profile.	0–7 7–24 24–36
LvE	Lehew very stony loam, 25 to 100 percent slopes.				
LwA	Lickdale silt loam, 0 to 5 percent slopes.	0	2–4+	Poorly drained and very poorly drained silt loam and very stony silt loam that are 3 or more feet thick and are in broad areas in depressions in the uplands.	0–10 10–27 27–36
Lx	Lickdale very stony silt loam.				
Lz	Lindside silt loam.	1½	4–10	Moderately well drained to somewhat poorly drained silt loam that is 4 or more feet thick; developed on alluvium; subject to flooding.	0–12 12–38 38–60
Ma	Made land.	(2)	(2)	Land that has been strip mined and the soil material moved or other material deposited on it so that the original soil profile cannot be determined.	(2)
MeB2	Meckesville silt loam, 3 to 8 percent slopes, moderately eroded.	3	5–10	Well-drained silt loams that are 3 to 5 or more feet thick; developed on slopes in colluvium derived from red shale, sandstone, and siltstone.	0–12 12–38 38–47
MeC2	Meckesville silt loam, 8 to 15 percent slopes, moderately eroded.				
MeD2	Meckesville silt loam, 15 to 25 percent slopes, moderately eroded.				
Mn	Melvin and Newark silt loams.	0	3¼–10	Poorly drained silt loams to sandy loams that are 3 to 4 or more feet thick; developed in alluvium; subject to flooding.	0–8 8–30 30–48

See footnotes at end of table.

Pa., and their estimated physical properties—Continued

Classification		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*	
GM, SM	A-2, A-4	50-80	45-65	20-45	2. 0-6. 3	. 16	4. 5			
GM, SM	A-1, A-2	45-65	40-60	15-35	0. 63-2. 0	. 13	4. 8	12	116	Low.
					0. 2-0. 63	. 10	5. 0	13	118	Low.
ML-CL	A-4, A-6	90-100	90-100	70-90	0. 63-2. 0	. 18	5. 2			
ML-CL	A-4, A-6	70-90	60 80	55-65	0. 63-2. 0	. 16	5. 3	16	107	Low.
					0. 2-0. 63	. 12	4. 8	13	116	Low.
SC, CL	A-4, A-6	65-85	60-80	40-60	2. 0-6. 3	. 20	7. 0			
GC, GM	A-2, A-4	40-60	30-50	20-40	0. 63-2. 0	. 14	5. 5	15	116	Low.
					0. 63-2. 0	. 10	5. 2	16	114	Low.
SM	A-2	70-90	65-85	20-35	>6. 3	. 12	4. 6			
GP-GM, GM	A-1, A-2	60-80	50-70	10-25	2. 0-6. 3	. 10	5. 2	10	120	Low.
					2. 0-6. 3	. 08	5. 2	12	180	Low.
SM-SC, GM	A-2, A-4	60-90	60-80	20-40	2. 0-6. 3	. 15	4. 6			
SM, GM	A-1, A-2	50-70	30-45	10-30	2. 0-6. 3	. 12	4. 8	10	118	Low.
					2. 0-6. 3	. 08	4. 8	10	120	Low.
ML	A-4	80-100	75-95	70-90	0. 63-2. 0	. 20	5. 0			
ML	A-4	70-90	65-85	60-80	<0. 2	(1)	4. 8	13	115	Medium.
					<0. 2	(1)	4. 8	13	115	Medium.
SM, ML	A-4	80-100	70-100	40-60	2. 0-6. 3	. 22	6. 6			
GM, SM	A-2, A-4	50-80	50-80	30-50	2. 0-6. 3	. 18	6. 6	16	120	Low.
					0. 2-0. 63	. 14	6. 8	16	120	Low.
(2)	(2)	(2)	(2)	(2)		(2)	(2)	(2)	(2)	
ML-CL, SM-SC	A-4	70-85	50-70	40-55	2. 0-6. 3	. 19	7. 2			
GM-GC	A-2, A-4	55-75	50-70	25-45	0. 63-2. 0	. 12	5. 8	13	117	Low.
					0. 2-0. 63	. 09	5. 0	11	120	Low.
ML-CL, ML	A-4	90-100	65-90	55-70	0. 63-2. 0	. 20	6. 6			
ML-CL, ML	A-4	80-100	65-90	60-80	0. 2-0. 63	. 16	6. 6	15	115	Low.
					0. 2-0. 63	. 12	7. 2	15	115	Low.

TABLE 5.—*Brief description of the soils of Clinton County,*

Map symbol	Soil	Depth to seasonally high water table	Depth to bedrock	Brief description of soil	Depth from surface (typical profile)
		Feet	*Feet*		*Inches*
MoB	Morrison cherty sandy loam, 3 to 8 percent slopes.	4	4–8	Well-drained cherty sandy loam that is 3 to 5 or more feet thick and is in the uplands; developed in material derived from cherty sandstone that contained little lime; contains a few to many chert fragments 1 to 4 inches in diameter.	0–9 9–36 36–60
MuA	Murrill gravelly loam, 0 to 3 percent slopes.	4	3–10	Well-drained gravelly loams or very stony loams that are 3 to 5 or more feet thick and on concave slopes; developed in colluvium derived from shale, sandstone, and siltstone; stones 1 to 3 feet in diameter are on the surface and throughout the profile.	0–10 10–62 62–68
MuB2	Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded.				
MuC2	Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded.				
MuC3	Murrill gravelly loam, 8 to 15 percent slopes, severely eroded.				
MuD2	Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded.				
MvB	Murrill very stony loam, 0 to 8 percent slopes.				
MvC	Murrill very stony loam, 8 to 25 percent slopes.				
NoA	Nolo silt loam, 0 to 3 percent slopes.	0	3–5	Poorly drained to somewhat poorly drained silt loam or very stony silt loam that is 3 to 5 feet thick and is on slightly concave areas in the uplands; developed from material derived from sandstone, siltstone, and shale; stones 1 to 3 feet in diameter are on the surface and in the profile.	0–16 16–30 30–36
NsA	Nolo very stony silt loam, 0 to 8 percent slopes.				
PoA	Pope loam, fans, 0 to 3 percent slopes.	3	3–20	Well-drained loams and very stony loams that are 3 to 6 or more feet thick; developed in alluvium derived from sandstone, shale, and siltstone; subject to flooding.	0–10 10–40 40–50
PoB	Pope loam, fans, 3 to 8 percent slopes.				
Ps	Pope very stony loam.				
Pu	Purdy silt loam.	0	3–6	Poorly drained to very poorly drained silt loam that is 3 to 6 or more feet thick; developed on high terraces in fine-textured alluvium from shale, sandstone, and siltstone.	0–9 9–34 34–60
Ra	Riverwash.	0	2–20	Cobbly and stony material on islands and severely eroded, poorly drained soil material on flood plains; profile cannot be determined.	(2)
Rb	Rubble land.	--------	0–20	Soil material between boulders, exposed bedrock, and areas of rockslides that lacks a distinct profile; boulders are as much as 10 feet in diameter; areas are too stony to support more than scattered vegetation.	(2)
Sf	Sequatchie fine sandy loam, high.	3	10–30	Well-drained loam and fine sandy loam that is 3 to 6 or more feet thick; developed on alluvium on high stream terraces.	0–15 15–35 35+
Sa	Sequatchie loam.				
Sn	Stony alluvial land.	0–3	5–50	Well-drained stony and cobbly material deposited on flood plains of streams that is 5 or more feet thick and contains fine material in places; subject to flooding.	--------

See footnotes at end of table.

Pa., and their estimated physical properties—Continued

Classification		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
					Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*	
					2.0–6.3	.15	5.0			
CL, SC	A–2, A–4	75–95	60–80	30–70	0.63–2.0	.10	5.2	17	110	Low.
CL, SC	A–2, A–4	60–90	60–85	20–60	0.63–2.0	.09	5.2	12	120	Low.
					2.0–6.3	.21	6.8			
ML–CL, SM	A–4, A–7	75–95	70–90	40–60	0.63–2.0	.09	5.3	19	110	Low.
ML–CL, SC	A–6, A–7	70–90	60–80	40–60	0.63–2.0	.09	5.5	16	110	Medium.
					2.0–6.3	.20	4.8			
ML–CL	A–4, A–6	90–100	85–95	55–80	0.2–0.63	.15	4.6	17	110	Medium.
CL, SM	A–4, A–6	80–100	70–90	45–65	<0.2	.12	4.4	16	110	Medium.
					2.0–6.3	.15	6.4			
CL, SM	A–2, A–4	70–100	60–100	25–55	0.63–2.0	.10	5.4	14	115	Low.
SM	A–2, A–4	60–90	55–85	20–45	0.63–2.0	.05	5.2	13	118	Low.
					0.63–2.0	.20	6.5			
ML–CL	A–6	80–100	65–85	50–70	0.2–0.63	.14	5.0	18	110	Medium.
ML, CL, SC	A–6	65–90	50–70	40–60	0.2–0.63	.10	4.8	22	115	Medium.
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	Low.
(2)	(2)	(2)	(2)	(2)	<0.63	(2)	(2)	(2)	(2)	Low.
					2.0–6.3	.20	5.0			
CL	A–6	80–100	70–90	60–80	0.63–2.0	.18	5.2	17	110	Medium.
SM	A–2, A–4	80–100	70–90	30–50	0.63–2.0	.12	5.2	12	119	Low.
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2).

TABLE 5.—*Brief description of the soils of Clinton County,*

Map symbol	Soil	Depth to seasonally high water table	Depth to bedrock	Brief description of soil	Depth from surface (typical profile)
		Feet	*Feet*		*Inches*
So	Stony land.	(3)	0–20	Soil material between boulders, exposed bedrock, and areas of rockslides that lacks a distinct profile; boulders are 1 to 6 feet or more in diameter; material is from sandstone and quartzite.	-------
St	Strip mines.	(2)	-------	Material stripped from anthracite mines that consists of stones, soil material, coal, and so on; topography is very irregular.	-------
Ty	Tygart silt loam.	½	3–6	Somewhat poorly drained to poorly drained silt loam that is 3 to 4 or more feet thick and is on high terraces; developed in alluvium derived from gray shale, siltstone, and sandstone.	0–8 8–28 28–36
UnB	Ungers loam, 3 to 8 percent slopes.	3	3–6	Well-drained loams that are 3 to 4 or more feet thick and are in the uplands; developed in material derived from red shale, siltstone, and sandstone.	0–11 11–24 24–38
UnB2	Ungers loam, 3 to 8 percent slopes, moderately eroded.				
UnC	Ungers loam, 8 to 15 percent slopes.				
UpB	Upshur silt loam, acid substratum, 2 to 8 percent slopes.	3	3–5	Well-drained silt loam that is 3 to 5 or more feet thick and is in the uplands; developed in material derived from red, clayey shale, and siltstone.	0–13 13–32 32–36+
WaA	Watson silt loam, 0 to 5 percent slopes.	2	4–12	Moderately well-drained silt loam that is 3 to 5 or more feet thick; developed from glacial till derived from sandstone, shale, and siltstone.	0–10 10–29 29–36
WnA2	Whitwell silt loam, 0 to 5 percent slopes, moderately eroded.	2	3–10	Moderately well drained to somewhat poorly drained silt loam that is 3 to 5 or more feet thick; developed in alluvium on low stream terraces.	0–14 14–38 38+
WtA	Wiltshire silt loam, 0 to 3 percent slopes.	2	5–12	Moderately well drained silt loams that contain some gravel and are 3 to 5 or more feet thick; developed on colluvium derived from soils from material weathered from limestone, shale, and sandstone.	0–11 11–53 53–61
WtB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded.				

[1] Free of moisture.
[2] Variable.
[3] Deep.

Pa., and their estimated physical properties—Continued

Classification		Percentage passing sieve—			Permeability	Available-moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200						
(2)	(2)	(2)	(2)	(2)	*Inches per hour* >6.3	*Inches per inch* (2)	*pH* (2)	*Percent* (2)	*Pounds per cubic foot* (2)	(2).
	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2).
					0.63–2.0	.20	5.0			
ML-CL	A-6	80–100	65–85	55–70	0.63–2.0	.16	4.8	18	110	Medium.
CL, GM	A-4, A-6	65–90	50–70	40–60	<0.2	.10	4.6	22	115	Medium.
					2.0–6.3	.22	4.8			
ML, CL	A-4	90–100	75–95	55–80	0.63–2.0	.18	4.8	15	115	Low.
GM-GC, ML	A-4	60–80	55–75	40–60	0.63–2.0	.16	4.8	13	118	Low.
					0.63–2.0	.20	5.0			
ML-CL	A-6	80–100	65–85	60–80	0.2–0.63	.14	5.2	20	110	Medium.
CL, SC	A-6	65–85	60–80	40–60	0.2–0.63	.12	5.2	20	110	Medium.
					0.63–2.0	.24	5.8			
ML-CL	A-4	75–95	60–80	50–70	0.2–0.63	.20	4.8	15	116	Low.
ML-CL, SC	A-2, A-4	65–85	55–75	30–60	0.2–0.63	.15	4.7	14	118	Low.
					0.63–2.0	.23	6.0			
CL, ML	A-6	80–100	70–90	60–80	0.2 –0.63	.18	4.8	13	115	Medium.
SM	A-2, A-4	80–100	70–90	30–50	0.2 –0.63	.16	5.0	13	115	Low.
					2.0 –6.3	.25	7.0			
CL	A-6	95–100	80–95	75–85	0.63–2.0	.13	5.8	16	113	Medium.
CL	A-4	95–100	80–95	60–80	0.2 –0.63	.10	5.5	15	114	Low.

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability for winter grading	Suitability of the soil material for—				Soil features affecting engineering practices[1]	
		Topsoil	Sand and gravel	Road subgrade	Road fill	Highway location	Dikes, levees, and embankments
Albrights (AbB, AbC2)	Fair	Good	Unsuitable	Poor	Fair	Subject to frost action.	No unfavorable features.
Allenwood (AfA, AgB, AgC2, AgC3, AgD3).	Good	Good	Unsuitable	Fair to good.	Good	No unfavorable features.	Moderate permeability.
Andover (AnB, AnB2, AnC2, AnD2, AoB, AoC).	Poor	Fair	Unsuitable	Fair to poor.	Fair	Seasonal high water table; fragipan.	Stoniness
Ashton (As)	Good	Good	Good for sand.	Fair to poor.	Good	No unfavorable features.	No unfavorable features.
Atkins (At)	Poor	Good	Unsuitable	Poor	Fair	Flooding; seasonal high water table; subject to frost action.	Instability
Barbour (Ba)	Good	Good	Fair	Fair to poor.	Fair	Flooding	No unfavorable features.
Basher (Bb, Bc)	Fair	Good	Unsuitable	Fair	Good	Flooding; seasonal high water table.	No unfavorable features.
Berks (BeB2, BeC2, BeD, BeD2, BeE, BeE2, BkB2, BkC2, BkD, BkD2, BkE2).	Good	Fair	Unsuitable	Fair to good.	Good	Shallow to fractured bedrock.	Rapid permeability.
Berks-Montevallo (BmB3, BmC3, BmD3, BmF, BmF2).	Good	Poor	Unsuitable	Good	Good	Shallow to fractured bedrock.	Rapid permeability.
Brinkerton (BrA2)	Poor	Fair	Unsuitable	Poor	Poor	Seasonal high water table; subject to frost action.	No unfavorable features.
Buchanan (BuB, BuB2, BuC2, BuC3, BuD2, BvB, BvC).	Fair	Fair	Unsuitable	Poor to fair.	Good	Seasonal high water table; fragipan.	Stoniness
Cavode (CaA, CaB)	Poor	Fair	Unsuitable	Poor	Fair	Seasonal high water table; claypan; subject to frost action.	Instability
Chenango (ChA, ChB)	Good	Poor	Good	Good	Good	No unfavorable features.	Rapid permeability.
Comly (CmA, CmB2, CmC2)	Fair	Fair	Unsuitable	Fair	Fair	Seasonal high water table; subject to frost action.	No unfavorable features.
Cookport (CoA, CoB, CoB2, CoC, CpB, CpC).	Poor	Fair	Unsuitable	Good	Good	Seasonal high water table; subject to frost action; fragipan.	Stoniness
Dekalb (DaA, DaB, DaB2, DaC, DaC2, DaD, DkB, DkC, DkE).	Good	Poor	Unsuitable	Fair	Good	Shallow to bedrock	Stoniness; rapid permeability.
Gilpin (GpA, GpB, GpC)	Good	Fair	Unsuitable	Fair	Good	Moderately deep to bedrock.	Moderately rapid permeability.
Guthrie (GuB2)	Poor	Fair	Unsuitable	Poor	Poor	High water table; claypan; subject to frost action.	Instability

See footnotes at end of table.

properties of soils in Clinton County, Pa.

Soil features affecting engineering practices [1]—Continued

Reservoir area for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways	Building sites	Infiltration of effluent from septic tanks	Construction and maintenance of pipelines
No unfavorable features.	Fragipan	No unfavorable features.	No unfavorable features.	Seasonal high water table.	Slow permeability; seasonal high water table.	Fluctuating seasonal water table.
Moderate permeability.	Not needed	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.
No unfavorable features.	Fragipan; stoniness.	Seasonal high water table.	Stoniness; seasonal high water table.	Seasonal high water table.	Seasonal high water table.	Seasonal high water table; stoniness.
Moderately rapid permeability in substratum.	No unfavorable features.	No unfavorable features.	Occasional flooding.	Occasional flooding.	No unfavorable features.	No unfavorable features.
No unfavorable features.	Seasonal high water table.	Seasonal high water table.	Frequent flooding.	Flooding; seasonal high water table.	Flooding; seasonal high water table.	Flooding; seasonal high water table.
Rapid permeability.	No unfavorable features.	No unfavorable features.	Flooding	Flooding	Flooding	Flooding.
Moderate permeability in substratum.	Flooding	No unfavorable features.	Flooding	Flooding; seasonal high water table.	Flooding; seasonal high water table.	Fluctuating high water table; flooding.
Shallow to bedrock; rapid permeability.	Not needed	Frequent applications of water needed.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock; rapid permeability.	Shallow to fractured shale.
Shallow to bedrock; rapid permeability.	Not needed	Frequent applications of water needed.	Shallow to bedrock.	Shallow to bedrock.	Shallow to bedrock; rapid permeability.	Shallow to fractured shale.
High water table.	Slow permeability.	High water table.	High water table.	Seasonal high water table.	Seasonal high water table; slow permeability.	Fluctuating high water table.
No unfavorable features.	Fragipan; stoniness.	No unfavorable features.	Stoniness	Seasonal high water table.	Seasonal high water table.	Fluctuating high water table.
No unfavorable features.	Slow permeability.	Slow intake rate.	No unfavorable features.	Seasonal high water table.	High water table; slow permeability.	Fluctuating high water table.
Rapid permeability.	Not needed	Low water-holding capacity.	Vegetation difficult to establish.	No unfavorable features.	Extremely rapid permeability; ground water likely to be contaminated.	No unfavorable features.
Moderately deep to shale.	Slow permeability.	Suitability questionable.	No unfavorable features.	Seasonal high water table.	Seasonal high water table; slow permeability.	Fluctuating high water table.
No unfavorable features.	Fragipan; stoniness; slow permeability.	No unfavorable features.	Stoniness	Seasonal high water table.	Seasonal high water table; slow permeability.	Fluctuating high water table.
Shallow to bedrock; rapid permeability.	Not needed	Low water-holding capacity.	Stoniness	Shallow to bedrock.	Shallow to bedrock; rapid permeability.	Stoniness; shallow to bedrock.
Moderately deep to bedrock; rapid permeability.	Not needed	Moderate water-holding capacity.	Shale outcrops in places.	Moderately deep to bedrock.	Moderately deep to bedrock; rapid permeability.	Moderately deep to bedrock.
Cavernous limestone.	Claypan; slow permeability.	Seasonal high water table.	Seasonal high water table.	Seasonal high water table.	Seasonal high water table; slow permeability.	Fluctuating high water table.

TABLE 6.—*Interpretation of engineering properties*

Soil series and map symbols	Suitability for winter grading	Suitability of the soil material for—				Soil features affecting engineering practices[1]	
		Topsoil	Sand and gravel	Road subgrade	Road fill	Highway location	Dikes, levees, and embankments
Hagerstown (HaC, HaD, HcE, HeA, HeA2, HeB2, HeC2, HeD2, HgB2, HgC2, HgC3, HgD3).	Fair	Good	Unsuitable	Poor	Fair	Subject to frost action.	Instability
Hartleton (HhA, HhB2, HhC2)	Good	Fair	Unsuitable	Fair	Good	No unfavorable features.	No unfavorable features.
Hartsells (HrA, HrA2, HrB, HrB2, HrC2, HsB).	Good	Fair	Unsuitable	Fair	Good	No unfavorable features.	Stoniness
Huntington (Ht, Hu, HvA, HvB).	Good	Good	Fair for sand.	Fair	Good	Flooding	Flooding
Klinesville (KcD3, KcE3)	Good	Poor	Unsuitable	Good	Good	Shallow to shale bedrock.	Rapid permeability.
Laidig (LaB2, LaC2, LaD2, LdB, LdC).	Good	Fair	Unsuitable	Good	Good	No unfavorable features.	Stoniness
Leadvale (LeB, LeC)	Fair	Fair	Unsuitable	Poor	Fair	Seasonal high water table; claypan; subject to frost action.	Instbaility
Leck Kill (LkB2, LkC2, LkD2, LkE, LkE2).	Good	Fair	Unsuitable	Good	Good	Moderately deep to shale bedrock.	No unfavorable features.
Leetonia (LnB, LnC)	Good	Poor	Good	Good	Good	No unfavorable features.	Stoniness
Lehew (LvC, LvE)	Good	Poor	Unsuitable	Good	Good	Moderately deep to sandstone.	Stoniness
Lickdale (LwA, Lx)	Poor	Fair	Unsuitable	Poor	Poor	High water table; subject to frost action.	Instability
Lindside (Lz)	Fair	Good	Unsuitable	Fair	Good	Flooding; seasonal high water table.	Occasional flooding
Made land (Ma)	(2)	Poor	Unsuitable	(2)	(2)	(2)	(2)
Meckesville (MeB2, MeC2, MeD2).	Good	Good	Unsuitable	Poor	Good	No unfavorable features.	No unfavorable features.
Melvin and Newark (Mn)	Poor	Fair	Unsuitable	Poor	Fair	Flooding; high water table; subject to frost action.	Flooding
Morrison (MoB)	Good	Fair	Fair for sand.	Good	Good	No unfavorable features.	Rapid permeability without compaction.
Murrill (MuA, MuB2, MuC2, MuC3, MuD2, MvB, MvC).	Good	Good	Unsuitable	Poor	Good	No favorable features.	Stoniness in places.
Nolo (NoA, NsA)	Poor	Fair	Unsuitable	Poor	Fair	Subject to frost action; high water table; instability.	Stoniness
Pope (PoA, PoB, Ps)	Good	Good	Fair	Good	Good	No unfavorable features.	Rapid permeability.

See footnotes at end of table.

of soils in Clinton County, Pa.—Continued

Soil features affecting engineering practices [1]—Continued						
Reservoir area for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways	Building sites	Infiltration of effluent from septic tanks	Construction and maintenance of pipelines
Moderately rapid permeability; cavernous limestone.	Not needed	No unfavorable features.	Limestone ledges	Subsidence around sinkholes; cavernous bedrock.	Ground water likely to be contaminated.	Ledges and bedrock.
Moderately rapid permeability.	Not needed	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.
Stoniness	Not needed	No unfavorable features.	Stoniness	Stoniness	Moderate permeability.	Stoniness.
Moderately rapid permeability.	Not needed	No unfavorable features.	Flooding	Flooding	Flooding	Flooding.
Rapid permeability; shallow to fractured shale bedrock.	Not needed	Low moisture-holding capacity.	Shallow to shale bedrock.	Shallow to shale bedrock.	Rapid permeability; shallow to shale bedrock.	Shallow to fractured shale bedrock.
No unfavorable features.	Not needed	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.	Stoniness.
No unfavorable features.	Claypan; moderate permeability.	No unfavorable features.	No unfavorable features.	Seasonal high water table.	Seasonal high water table.	Fluctuating seasonal water table.
Moderately deep to shale; rapid permeability of substratum.	Not needed	No unfavorable features.	No unfavorable features.	Moderately deep to shale.	Moderately deep to fractured shale.	Moderately deep to fractured shale.
Rapid permeability; moderately deep to bedrock.	Not needed	Low moisture-holding capacity; frequent applications of water needed.	Stoniness	No unfavorable features.	Rapid permeability; shallow to bedrock in places.	Stoniness.
Rapid permeability; moderately deep to bedrock.	Not needed	Low moisture-holding capacity; frequent applications of water needed.	Stoniness	Moderately deep to sandstone.	Shallow to bedrock in places.	Stoniness; moderately deep to bedrock.
Stoniness	Slow permeability.	High water table	High water table	High water table; instability.	High water table; slow permeability.	High water table.
Rapid permeability in sand lenses.	No unfavorable features.	No unfavorable features.	Flooding	Flooding; seasonal high water table.	Seasonal high water table; flooding.	Fluctuating water table; flooding.
[2]	[2]	[2]	[2]	[2]	[2]	[2].
No unfavorable features.	Not needed	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.
No unfavorable features.	Slow permeability.	High water table	Flooding	High water table; flooding.	High water table; flooding.	High water table; flooding.
Rapid permeability.	Not needed	Low moisture-holding capacity; frequent applications of water needed.	Erosion	No unfavorable features.	No unfavorable features.	No unfavorable features.
Cavernous limestone bedrock in places.	Not needed	No unfavorable features.	No unfavorable features.	Cavernous limestone in places.	Rapid permeability; ground water likely to be contaminated.	No unfavorable features.
High water table	Slow permeability.	High water table	High water table	High water table	High water table; slow permeability.	High water table.
Rapid permeability.	Not needed	Low moisture-holding capacity; frequent applications of water needed.	Erosion	No unfavorable features.	Rapid permeability; ground water likely to be contaminated.	No unfavorable features.

TABLE 6.—*Interpretation of engineering properties*

Soil series and map symbols	Suitability for winter grading	Suitability of the soil material for—				Soil features affecting engineering practices [1]	
		Topsoil	Sand and gravel	Road subgrade	Road fill	Highway location	Dikes, levees, and embankments
Purdy (Pu)	Poor	Fair	Unsuitable	Poor	Poor	Subject to frost action; high water table; instability.	Instability
Riverwash (Ra)	Poor	Poor	Fair to good.	Poor	Fair	Frequent flooding	Rapid permeability; instability.
Rubble land (Rb)	Good	Poor	Unsuitable	Poor	Poor	Loose boulders	Stoniness
Sequatchie (Sa, Sf)	Good	Good	Unsuitable	Fair	Good	No unfavorable features.	No unfavorable features.
Stony alluvial land (Sn)	Good	Poor	Good	Poor	Good	Flooding	Unsuitable
Stony land (So)	Good	Poor	Unsuitable	Poor	Poor	Shallow to bedrock; stoniness.	Unsuitable
Strip mines (St)	Good	Poor	Unsuitable	(2)	Good	(2)	(2)
Tygart (Ty)	Poor	Fair	Unsuitable	Poor	Poor	Seasonal high water table; claypan; subject to frost action.	Instability
Ungers (UnB, UnB2, UnC)	Good	Fair	Unsuitable	Fair	Good	Bedrock at a depth of 3 to 6 feet.	No unfavorable features.
Upshur (UpB)	Fair	Fair	Unsuitable.	Poor	Fair	Instability	Instability
Watson (WaA)	Fair	Fair	Unsuitable.	Fair	Good	Seasonal high water table; fragipan.	No unfavorable features.
Whitwell (WhA2)	Fair	Fair	Unsuitable.	Fair	Fair	Seasonal high water table; subject to frost action.	Instability
Wiltshire (WtA, WtB2)	Fair	Good	Unsuitable.	Poor	Fair	Seasonal high water table.	Instability

[1] The features mentioned are those that cause difficulty in the stated kind of construction.

roadways. Such material should be removed and replaced with suitable material. Some soils, particularly those near Fishing Creek, Beech Creek, and Bald Eagle Creek, are flooded frequently. Roadways constructed in these areas and in other low-lying areas should be built on embankments so that the surface of the pavement is at least 3 feet above the level of the water table.

A high water table or a prolonged wet period makes earthwork difficult in soils that are moderately well drained to poorly drained. Such soils are susceptible to frost action, and the average depth of frost penetration in the area is estimated to be 17 inches. Therefore, the best time for highway work to be done in areas of these soils is during July and August. If highway cuts are planned at a location where the water table is high, a survey should be made to determine the needs for interceptor drains and underdrains. Seepage along the back slopes of cuts may cause slumping or sliding of the underlying material. If the water table is shallow below the pavement, ice lenses may form in the subgrade and differential volume changes may occur and cause the pavement to break.

Table 6 includes columns that show the most common hazards to look for in locating housing on the various soils. It also give the limitations of the soils for infiltration fields for disposing of septic tank effluent. Construction hazards are a high water table, which results in wet basements; unstable soil material, which does not give solid support; flooding; and for a few soils, steep slopes. Some soil series contain soils that have a wide range of slopes. These soils are good for housing on moderate slopes but are poor on the steep slopes. Obstacles to the use of tile distribution fields for disposing of sewage effluent include a high water table, slow soil permeability, flooding, and excessive stoniness.

Descriptions of the Soils

This section is provided for those who want detailed information about the soils in the county. It describes each soil series and then each mapping unit; that is, the areas on the detailed soil map that are bounded by lines

of soils in Clinton County, Pa.—Continued

Soil features affecting engineering practices [1]—Continued						
Reservoir area for farm ponds	Agricultural drainage	Irrigation	Terraces, diversions, and waterways	Building sites	Infiltration of effluent from septic tanks	Construction and maintenance of pipelines
High water table.	Slow permeability.	Wetness.	High water table.	High water table; instability.	High water table; slow permeability.	Fluctuating high water table.
Rapid permeability.	Unsuitable for crops.	Unsuitable for crops.	Unsuitable; flooding.	Frequent flooding.	Frequent flooding.	Frequent flooding; high water table.
Rapid permeability.	Unsuitable for crops.	Unsuitable for crops.	Stoniness; unsuitable.	Stoniness; steep slopes.	Stoniness.	Stoniness; steep slopes.
Sand lenses in places.	Not needed.	No unfavorable features.	No unfavorable features.	Occasional flooding.	Ground water likely to be contaminated.	Occasional flooding.
Unsuitable.	Unsuitable for crops.	Unsuitable for crops.	Flooding.	Flooding.	Flooding; high water table.	Flooding; fluctuating high water table.
Unsuitable.	Not needed.	Unsuitable for crops.	Stoniness.	Stoniness.	Generally not suitable.	Stoniness; shallow to bedrock.
[2].	Generally not applicable.	[2].	[2].	[2].	[2].	Variable acidity.
No unfavorable features.	Claypan; slow permeability.	Shallow to claypan.	No unfavorable features.	Seasonal high water table	Seasonal high water table; slow permeability.	Fluctuating high water table.
No unfavorable features.	Not needed.	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.	No unfavorable features.
Moderately deep to shale.	Not needed.	Slow permeability.	No unfavorable features.	Moderately deep to shale.	Slow permeability.	Moderately deep to shale.
No unfavorable features.	Fragipan.	No unfavorable features.	No unfavorable features.	Seasonal high water table.	Seasonal high water table; slow permeability.	Fluctuating high water table.
No unfavorable features.	Slow permeability.	Slow permeability.	No unfavorable features.	Occasional flooding.	Slow permeability.	Fluctuating high water table.
Cavernous limestone bedrock.	No unfavorable features.	No unfavorable features.	No unfavorable features.	Seasonal high water table.	Seasonal high water table.	Fluctuating high water table.

[2] Variable.

and identified by a symbol. The soils are described in alphabetical order.

In the descriptions that follow, the series description mentions features that apply to all of the soils it contains. Unless otherwise stated, the profile described is considered to be representative for all the soils in the series. The descriptions of the soils in the series generally tell how their profile differs from the one given as representative for the series, or these differences are indicated in the soil name. A few of the soil properties described are particularly significant in understanding soils and their behavior.

The color of a soil is generally related to the amount of organic matter in the surface layer. The darker the surface soil, the more organic matter it generally contains. Dark soils readily absorb heat from the sun, and plants therefore can begin growing on them early in spring. Consequently, dark, well-drained soils are well suited to the growing of vegetables that mature early. Streaks and spots of gray, yellow, and brown in the lower layers of a soil generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. It is also checked from time to time by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate. Each individual soil is identified by a textural name, such as *silt loam*, which refers to the texture of the surface layer.

Structure is the way the individual soil particles are arranged in larger grains, or aggregates, and the amount of pore space between the grains. The structure of a soil is named by the strength or grade, by the size, and by the shape of the aggregates. For example, a layer may consist of soil materials that have *weak, fine, blocky structure.*

Relief is important in soils that are used for agriculture. Many of the soils in the county have uniform, smooth slopes; others have steep and broken slopes. The percentage of slope given for a soil indicates the number of feet of fall per 100 feet of horizontal distance.

Drainage is influenced by the depth, texture, structure, permeability, and water-supplying capacity of the soil. In this report the terms used to describe drainage indicate the thickness of the aerated root zone of the soils. The principal terms are—*well drained*, at least 36 inches of aerated root zone; *moderately well drained*, 16 to 36 inches of aerated root zone; *somewhat poorly drained*, 6 to 16 inches of aerated root zone; *poorly drained*, 0 to 6 inches of aerated root zone; and *very poorly drained*, lacking a well-aerated root zone.

Reaction, which is determined in the field or by laboratory tests, shows how acid or alkaline a soil is. It is expressed as the pH value. The pH of soils of the same type that are cultivated may differ widely, depending on past management. Soils of the same type in woodland, however, all tend to have a similar reaction.

Other terms used in describing the soils are defined in the Glossary. For more general information about the soils, the reader can refer to the section "General Soil Map," in which the broad patterns of soils are described. Technical descriptions of each series are provided in the subsection "Detailed Descriptions of Soil Profiles." The approximate acreage and proportionate extent of each soil mapped in the county are given in table 7, and the location is shown on the soil map at the back of this report.

TABLE 7.—*Approximate acreage and proportionate extent of the soils*

Soils	Acres	Percent
Albrights silt loam, 3 to 8 percent slopes	589	0.1
Albrights silt loam, 8 to 15 percent slopes, moderately eroded	190	(1)
Allenwood fine sandy loam, 0 to 5 percent slopes	225	(1)
Allenwood gravelly silt loam, 3 to 8 percent slopes	230	(1)
Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded	118	(1)
Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded	47	(1)
Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded	19	(1)
Andover gravelly loam, 2 to 8 percent slopes	232	(1)
Andover gravelly loam, 2 to 8 percent slopes, moderately eroded	304	.1
Andover gravelly loam, 8 to 15 percent slopes, moderately eroded	784	.1
Andover gravelly loam, 15 to 25 percent slopes, moderately eroded	217	(1)
Andover very stony loam, 0 to 8 percent slopes	860	.1
Andover very stony loam, 8 to 25 percent slopes	999	.2
Ashton silt loam	4,626	.8
Atkins silt loam	1,507	.2
Barbour fine sandy loam	2,562	.4
Basher fine sandy loam	611	.1
Basher silt loam	1,364	.2
Berks channery silt loam, 3 to 8 percent slopes, moderately eroded	852	.1
Berks channery silt loam, 8 to 15 percent slopes, moderately eroded	3,247	.6
Berks channery silt loam, 15 to 25 percent slopes	878	.1
Berks channery silt loam, 15 to 25 percent slopes, moderately eroded	2,938	.5
Berks channery silt loam, 25 to 35 percent slopes	3,116	.5
Berks channery silt loam, 25 to 35 percent slopes, moderately eroded	5,105	.9
Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded	58	(1)
Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded	572	.1
Berks shaly silt loam, 15 to 25 percent slopes	760	.1
Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded	533	.1
Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded	293	.1
Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded	86	(1)
Berks-Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded	652	.1
Berks-Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded	887	.2
Berks-Montevallo channery silt loams, 35 to 100 percent slopes	1,164	0.2
Berks-Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded	881	.1
Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded	238	(1)
Buchanan gravelly loam, 3 to 8 percent slopes	112	(1)
Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded	754	.1
Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded	2,243	.4
Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded	214	(1)
Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded	318	.1
Buchanan very stony loam, 0 to 8 percent slopes	644	.1
Buchanan very stony loam, 8 to 25 percent slopes	1,034	.2
Cavode silt loam, 0 to 3 percent slopes	227	(1)
Cavode silt loam, 3 to 8 percent slopes	3,405	.6
Chenango gravelly loam, 0 to 3 percent slopes	333	.1
Chenango gravelly loam, 3 to 8 percent slopes	243	(1)
Comly silt loam, 0 to 3 percent slopes	163	(1)
Comly silt loam, 3 to 8 percent slopes, moderately eroded	1,205	.2
Comly silt loam, 8 to 15 percent slopes, moderately eroded	631	.1
Cookport loam, 0 to 3 percent slopes	764	.1
Cookport loam, 3 to 8 percent slopes	2,457	.4
Cookport loam, 3 to 8 percent slopes, moderately eroded	193	(1)
Cookport loam, 8 to 15 percent slopes	631	.1
Cookport very stony loam, 0 to 8 percent slopes	14,888	2.6
Cookport very stony loam, 8 to 25 percent slopes	2,850	.5
Dekalb channery loam, 0 to 3 percent slopes	1,284	.2
Dekalb channery loam, 3 to 8 percent slopes	11,434	1.9
Dekalb channery loam, 3 to 8 percent slopes, moderately eroded	1,232	.2
Dekalb channery loam, 8 to 15 percent slopes	3,265	.5
Dekalb channery loam, 8 to 15 percent slopes, moderately eroded	1,182	.2
Dekalb channery loam, 15 to 25 percent slopes	2,147	.4
Dekalb very stony soils, 0 to 8 percent slopes	62,283	10.8
Dekalb very stony soils, 8 to 25 percent slopes	102,508	17.7
Dekalb very stony soils, 25 to 100 percent slopes	179,851	31.1
Gilpin silt loam, 0 to 3 percent slopes	281	(1)
Gilpin silt loam, 3 to 8 percent slopes	5,040	.9
Gilpin silt loam, 8 to 15 percent slopes	4,218	.7
Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded	144	(1)

See footnote at end of table.

TABLE 7.—*Approximate acreage and proportionate extent of the soils*—Continued

Soils	Acres	Percent
Hagerstown rocky silt loam, 5 to 15 percent slopes	425	0.1
Hagerstown rocky silt loam, 15 to 25 percent slopes	342	.1
Hagerstown rocky silty clay loam, 25 to 70 percent slopes	329	.1
Hagerstown silt loam, 0 to 3 percent slopes	1,069	.2
Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded	263	(1)
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded	10,022	1.7
Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded	2,635	.4
Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded	742	.1
Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded	251	(1)
Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded	207	(1)
Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded	808	.1
Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded	322	.1
Hartleton channery silt loam, 0 to 3 percent slopes	99	(1)
Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded	347	.1
Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded	243	(1)
Hartsells channery loam, 0 to 3 percent slopes	570	.1
Hartsells channery loam, 0 to 3 percent slopes, moderately eroded	203	(1)
Hartsells channery loam, 3 to 8 percent slopes	1,828	.3
Hartsells channery loam, 3 to 8 percent slopes, moderately eroded	1,641	.3
Hartsells channery loam, 8 to 15 percent slopes, moderately eroded	474	.1
Hartsells very stony loam, 0 to 8 percent slopes	1,270	.2
Huntington fine sandy loam	790	.1
Huntington silt loam	336	.1
Huntington silt loam, local alluvium, 0 to 3 percent slopes	437	.1
Huntington silt loam, local alluvium, 3 to 8 percent slopes	471	.1
Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded	26	(1)
Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded	118	(1)
Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded	144	(1)
Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded	835	.1
Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded	415	.1
Laidig very stony loam, 0 to 8 percent slopes	505	.1
Laidig very stony loam, 8 to 25 percent slopes	2,679	.5
Leadvale silt loam, 3 to 8 percent slopes	685	.1
Leadvale silt loam, 8 to 15 percent slopes	544	.1
Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded	215	(1)
Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded	606	.1
Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded	958	.2
Leck Kill channery silt loam, 25 to 35 percent slopes	694	.1
Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded	529	0.1
Leetonia very stony sandy loam, 0 to 8 percent slopes	3,738	.6
Leetonia very stony sandy loam, 8 to 25 percent slopes	971	.2
Lehew very stony loam, 8 to 25 percent slopes	9,382	1.6
Lehew very stony loam, 25 to 100 percent slopes	27,641	4.8
Lickdale silt loam, 0 to 5 percent slopes	906	.2
Lickdale very stony silt loam	175	(1)
Lindside silt loam	1,714	.3
Made land	501	.1
Meckesville silt loam, 3 to 8 percent slopes, moderately eroded	1,003	.2
Meckesville silt loam, 8 to 15 percent slopes, moderately eroded	2,005	.3
Meckesville silt loam, 15 to 25 percent slopes, moderately eroded	508	.1
Melvin and Newark silt loams	1,986	.3
Morrison cherty sandy loam, 3 to 8 percent slopes	138	(1)
Murrill gravelly loam, 0 to 3 percent slopes	163	(1)
Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded	3,579	.6
Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded	2,725	.5
Murrill gravelly loam, 8 to 15 percent slopes, severely eroded	344	.1
Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded	495	.1
Murrill very stony loam, 0 to 8 percent slopes	470	.1
Murrill very stony loam, 8 to 25 percent slopes	124	(1)
Nolo silt loam, 0 to 3 percent slopes	561	.1
Nolo very stony silt loam, 0 to 8 percent slopes	1,023	.2
Pope loam, fans, 0 to 3 percent slopes	2,556	.4
Pope loam, fans, 3 to 8 percent slopes	1,074	.2
Pope very stony loam	949	.2
Purdy silt loam	418	.1
Riverwash	154	(1)
Rubble land	305	.1
Sequatchie loam	1,610	.3
Sequatchie fine sandy loam, high	1,614	.3
Stony alluvial land	6,723	1.2
Stony land	10,782	1.9
Strip mines	3,375	.6
Tygart silt loam	248	(1)
Ungers loam, 3 to 8 percent slopes	1,584	.3
Ungers loam, 3 to 8 percent slopes, moderately eroded	993	.2
Ungers loam, 8 to 15 percent slopes	1,488	.3
Upshur silt loam, acid substratum, 2 to 8 percent slopes	508	.1
Watson silt loam, 0 to 5 percent slopes	276	(1)
Whitwell silt loam, 0 to 5 percent slopes, moderately eroded	571	.1
Wiltshire silt loam, 0 to 3 percent slopes	493	.1
Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded	77	(1)
Clay mines	133	(1)
Mine spoil	171	(1)
Gravel pits	27	(1)
Total	577,280	100.0

[1] Less than 0.1 percent.

Albrights Series

The Albrights series consists of deep, moderately well drained to somewhat poorly drained, reddish, nearly level to gently sloping soils. These soils are in the uplands, mainly in the north-central part of the county. They formed in material derived from acid red shale, siltstone, and fine-grained sandstone.

On an area not plowed, the surface layer is 7 to 12 inches thick. The top 1 to 3 inches is very dark grayish-brown, friable silt loam. It is underlain by 2 to 4 inches of brown, friable heavy silt loam. Below this is reddish-brown, friable heavy silt loam 4 to 7 inches thick. In cultivated areas plowing has mixed these three layers, and the resulting plow layer is very dark grayish-brown, friable silt loam.

Reddish-brown, friable silty clay loam or silty clay 10 to 13 inches thick makes up the upper part of the subsoil. This layer is very acid. The lower part of the subsoil is reddish-brown or dark reddish-brown, firm, dense gravelly silt loam that has few to common, distinct mottles of strong brown. The substratum is dusky red, firm gravelly sandy loam. It is nonsticky and nonplastic when wet and is very strongly acid.

Depth to mottling ranges from 16 to 30 inches. The underlying red shale, siltstone, and red, fine-grained sandstone are at a depth of 4 to 10 feet.

The Albrights soils are near the Ungers and Upshur soils. They are similar to those soils in depth but are not so well drained.

Permeability of the surface layer and of the upper part of the subsoil is moderate, but that of the lower part of the subsoil is slow. Ability to hold moisture for plant growth is good.

These soils are easy to work and are suited to all crops grown in the county. Crops on them respond well if lime and fertilizer are applied.

Albrights silt loam, 3 to 8 percent slopes (AbB).—This gently sloping soil is in the uplands in the northern part of the county. Its profile is like that described for the series.

Small areas of more poorly drained soils are included in the mapped areas. Ungers, Upshur, Hartsells, and Dekalb soils are adjacent to many areas.

Albrights silt loam, 3 to 8 percent slopes, has good ability to hold moisture for plants. Runoff is medium; erosion is slight because most of this soil is in woodland and is relatively undisturbed.

The dominant trees are maple, red oak, white oak, and white pine. Trees grow well and rapidly on this soil. Because of its dense subsoil, however, this soil is not well suited to alfalfa, sweetclover, or other deep-rooted crops. If this soil is cultivated, diversion terraces and graded striperopping are needed. Capability unit IIe-4; woodland suitability group 9.

Albrights silt loam, 8 to 15 percent slopes, moderately eroded (AbC2).—This moderately sloping soil is at the base of the escarpment in the shale hills. Small areas that have undergone little or no erosion are included in the mapped areas.

Permeability of this soil is moderate. The moisture-holding capacity for plants is moderately high, and runoff is medium. Crops on this soil respond well if fertilizer is applied.

This soil is suited to most crops grown in the county. Birdsfoot trefoil is well suited, and alfalfa is moderately well suited. A crop rotation of low intensity is needed. Diversion terraces and graded striperopping are needed for the control of runoff and to reduce erosion. Tile can be used to drain seep spots. Capability unit IIIe-3; woodland suitability group 9.

Allenwood Series

The Allenwood series consists of deep, well-drained, nearly level to moderately sloping soils that have a firm, reddish subsoil. These soils formed in old glacial till derived from sandstone, shale, and quartzite. In this county they are only on ridgetops in the shale hills between Beech Creek and Avis in an area that is 1 to 2 miles wide.

The plow layer is 5 to 8 inches of grayish-brown, very acid, friable gravelly silt loam. It contains numerous fine chips of shale. The upper part of the subsoil is yellowish-brown, friable silt loam that is 6 to 10 inches thick and contains numerous chips of shale. The lower part of the subsoil is 10 to 16 inches of firm, yellowish-red, sticky silty clay loam that contains numerous chips of shale and fragments of sandstone. Both layers of subsoil are strongly acid. The substratum is yellowish-red, firm, nonsticky silt loam that is 10 to 18 inches thick and contains many chips of shale and fragments of sandstone. Below this is a 6-inch layer of weathered shale.

Acid, yellow shale is at a depth of 3½ to 5 feet. In some places this underlying shale is horizontal, but it is tilted and warped in others. Most of the material in which these soils formed was derived from the underlying shale.

The texture of the surface layer is mainly gravelly silt loam. The color of the subsoil ranges from yellowish red to nearly yellow. The amount of shale chips ranges from a few to many. Depth to shale bedrock ranges from 3½ to 5 feet.

The Allenwood soils are near the shallow to very shallow, well-drained Berks-Montevallo channery silt loams and the deep, well-drained Hartleton soils. They are also near the moderately well drained Watson and Comly soils, and the Brinkerton soils, which are poorly drained. They are deeper, redder, and finer textured than the Hartleton soils but are not so fine textured as the Hagerstown soils.

The Allenwood soils are permeable to roots and water and have moderately high moisture-holding capacity for plants. If acidity is corrected and enough fertilizer is applied, these soils produce moderate yields of crops.

These soils are suited to corn, oats, wheat, barley, and other crops commonly grown. Alfalfa generally grows moderately well. Virginia pine is the first tree species to reseed on fields left idle. Then white pine and red oak, white oak, and other hardwood trees gradually begin to reseed and eventually become dominant in the stand.

Allenwood fine sandy loam, 0 to 5 percent slopes (AfA).—This nearly level soil is in the uplands near Avis. Its profile is similar to the one described for the series; however, its surface layer is fine sandy loam, and its subsoil is sandier and more gravelly.

This soil is strongly acid. Permeability to water is moderately rapid, and moisture-holding capacity is high. Crops on this soil respond well if fertilizer is applied.

This soil is well suited to all crops grown in the county. Yields are moderately high. A crop rotation of high in-

tensity can be used if crop residues are returned to the soil to help maintain organic matter. Capability unit I–2; woodland suitability group 1.

Allenwood gravelly silt loam, 3 to 8 percent slopes (AgB).—This gently sloping soil is in the shale hills between Avis and Beech Creek.

Permeability to moisture and roots is good, and the moisture-holding capacity for plants is high. The soil is strongly acid, but it is easy to work, and crops on it respond well if fertilizer and lime are applied.

Included with this soil in mapping are small areas of nearly level Allenwood soils and of Watson and Hartleton soils.

This Allenwood soil is well suited to all crops grown in the county. Yields of alfalfa are moderately good. A crop rotation of moderately high intensity can be used if diversion terraces and contour stripcropping are used for control of runoff. Applying moderate to large amounts of lime helps correct acidity. Capability unit IIe–2; woodland suitability group 1.

Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded (AgC2).—This moderately sloping soil is on the shale hills between Beech Creek and Pine Creek. Its profile is the one described for the series. Most areas are near the Hartleton soils. A few areas, however, are near the steeper, shallow Montevallo soils, and some large areas are northwest of Avis and west of Lock Haven, north of Bald Eagle Creek.

The soil has a few seep spots and contains many small fragments of sandstone, shale, and quartzite. Also, in places there are a few larger fragments of sandstone 8 to 10 inches in diameter. Many of the fragments have rounded edges. This soil has good moisture-holding capacity for plants, even during droughts. It is easy to work and is moderately productive.

Included in mapping are some areas less than an acre in size, which are steeper and more severely eroded than this soil.

Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded, is suited to most crops grown in the county. Alfalfa grows somewhat poorly. Diversion terraces, graded stripcropping, and a 4-year rotation that includes 2 years of hay help to control erosion and to maintain productivity. Capability unit IIIe–2; woodland suitability group 1.

Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded (AgC3).—This moderately sloping soil is on the shale hills between Avis and Beech Creek. Most of the surface layer has been removed through erosion, and numerous, small fragments of shale and sandstone have been left on the surface. In a few areas enough of these fragments have accumulated to provide a protective cover against heavy rains. In many places material from the yellowish-red subsoil is exposed. Small gullies have been cut in many areas.

Permeability of this soil to water is moderate, but rapid runoff lowers the amount of water available for plants. The moisture-holding capacity for plants is moderate. This soil is strongly acid to very strongly acid. Crops on it respond well if fertilizer is added.

This soil is generally used for hay, pasture, or trees. It is well suited to birdsfoot trefoil but is not well suited to alfalfa. Diversion terraces are needed for control of runoff and to reduce erosion. A suitable rotation would be 1 year of a row crop, 1 year of a small grain, and 4 years of hay. Reseeding should be done in contour strips. The maximum amount of lime is needed. Capability unit IVe–2; woodland suitability group 3.

Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded (AgD3).—This moderately steep soil is on the shale hills between Beech Creek and Pine Creek. The surface layer is yellowish-brown silty clay loam that contains numerous fragments of shale and sandstone. Large areas of bare soil are common. Small gullies have been cut in many areas.

Permeability of this soil is moderate, but the moisture-holding capacity for plants is low. This soil is strongly acid to very strongly acid. Runoff is rapid.

The vegetation on this soil consists mainly of cinquefoil, dewberry, goldenrod, and staghorn sumac. The soil is probably best suited to pasture, and birdsfoot trefoil grows well. Reseeding should be done in contour strips. Diversion terraces can be used to remove excess water safely. Capability unit VIe–1; woodland suitability group 3.

Andover Series

The Andover series consists of poorly drained to somewhat poorly drained, brownish, slightly sloping to sloping soils that have a very firm, mottled subsoil. These soils formed in material derived from sandstone and shale, which has accumulated at the base of mountains and ridges in the Ridge and Valley province in the southern one-third of the county.

The surface layer is very dark brown very stony loam 3 to 6 inches thick. Beneath this is a similar layer, 3 to 5 inches thick, of lighter brown very stony loam that is slightly sticky when wet and contains a few faint mottles.

The upper part of the subsoil is brown very stony loam that extends to a depth of 14 inches. This layer contains many, prominent, reddish-yellow mottles and some fine, gravelly, silty lenses. It is sticky when wet and is medium acid. The lower part of the subsoil is dark grayish-brown fine sandy loam that contains many distinct mottles of light brown and light gray. It is very firm when moist, but it is sticky when wet. This layer is medium acid. Lenses of gravel and sand are common. The substratum is brown, very firm, nonsticky gravelly sandy loam 2 to 3 feet or more thick. It has many prominent mottles of light brownish gray and light reddish brown and is slightly acid to medium acid.

Depth to hard bedrock ranges from 4 to 20 feet or more. The color of the subsoil ranges from yellowish red to olive yellow. The content of coarse fragments ranges from 10 to more than 50 percent of the volume.

Andover soils occupy a small acreage in the county and are not important to agriculture. They are near the well-drained Laidig soils and the moderately well drained to somewhat poorly drained Buchanan soils. Andover soils are in the same general area as the Murrill and Dekalb soils, but they are generally on higher slopes than the Murrill soils and on lower slopes than the Dekalb soils.

The subsoil of the Andover soils is very slowly permeable to water. The surface layer and subsoil overlying the pan, or very firm subsoil, both have a moderate capacity for holding water for plants. Even moderate amounts of rainfall make the soils too wet to cultivate. Andover soils warm up late in spring and become wet early in fall.

If they are grazed or worked when too wet, these soils are likely to compact and become cloddy. The gravelly loams are easy to cultivate if their moisture content is right when they are plowed.

Andover soils are better suited to perennial hay, pasture, or trees than to row crops. Birdsfoot trefoil grows well, but alfalfa grows poorly. Most of the Andover soils are in woodland that is made up mainly of white pine, hemlock, and maple but that includes some white oak and red oak.

Andover gravelly loam, 2 to 8 percent slopes (AnB).—This gently sloping soil is near the toes of slopes east of Carroll in Sugar Valley. Its profile is similar to that described for the series, but it lacks the many large fragments of sandstone.

This soil holds a moderate amount of moisture but does not release it readily to plants. Moisture moves very slowly through the soil because of the very firm subsoil. The numerous fragments of channery sandstone hinder cultivation, but the soil is otherwise easy to prepare for planting. Runoff is medium to slow, and moisture penetrates the soil slowly. Consequently, this soil remains wet longer in spring than well-drained soils, and early preparation of the seedbed is not feasible. Crops on this soil respond slowly to lime and fertilizer.

Included with this soil in mapping are many wetter areas that are too small to be mapped separately.

This Andover soil is better suited to permanent hay, pasture, or trees than to row crops. Diversion terraces and graded strips are needed for the control of erosion. Tile can be used to drain seep spots. Capability unit IVw–2; woodland suitability group 9.

Andover gravelly loam, 2 to 8 percent slopes, moderately eroded (AnB2).—This gently sloping soil is in upland areas that border limestone valleys. The surface layer is 4 to 5 inches thick and contains numerous sandstone fragments, but the profile of this soil is otherwise similar to the one described for the series.

Permeability of this soil to water is slow. The moisture-holding capacity for plants during droughts is low. This soil is moderately low to low in fertility. Crops on it respond slowly to lime and fertilizer.

This soil is suited to permanent hay, pasture, or trees. Diversion terraces and graded strips are needed for control of erosion. Tile can be used to drain seep spots. Capability unit IVw–2; woodland suitability group 9.

Andover gravelly loam, 8 to 15 percent slopes, moderately eroded (AnC2).—This moderately sloping soil is near the base of mountains. The surface layer is 3 to 6 inches thick and contains numerous channery fragments. In places material from the subsoil has been mixed with the surface layer.

Permeability to water is slow in this soil, and plant roots penetrate to a depth of 6 to 8 inches. Crops on this soil respond slowly to fertilizer.

This soil is better suited to permanent hay, pasture, or trees than to row crops. Suitable hay and pasture plants are those that tolerate wetness. Yields of deep-rooted crops and other crops are poor. Diversion terraces and seeding in strips help to control runoff and reduce erosion. Capability unit IVw–2; woodland suitability group 9.

Andover gravelly loam, 15 to 25 percent slopes, moderately eroded (AnD2).—This moderately steep soil is in the uplands near the base of the mountains. It is similar to the soil described for the series, except that it contains fewer stones and boulders and more coarse fragments of shale and standstone.

Permeability to water is slow, and during droughts the soil holds only a small amount of moisture for plants. Runoff is medium, but the soil is kept wet by water from seeps and springs. Crops on this soil respond slowly to fertilizer.

This soil is better suited to pasture and trees than to row crops. Diversion terraces installed along seep lines help remove much of the excess water and thus improve drainage. Capability unit VIe–4; woodland suitability group 9.

Andover very stony loam, 0 to 8 percent slopes (AoB).—This nearly level to gently sloping soil is at the base of slopes in the Ridge and Valley province. Its profile is the one described as representative for the series. The soil contains many gray sandstone boulders and slabs that are generally 8 inches to 4 feet in diameter.

Water seeps very slowly through the subsoil. Runoff is slow. As a result, the movement of water through the profile is slow and the surface layer is wet most of the year.

This soil is poorly suited to pasture, and all of it is wooded. The wetness and many large boulders make the soil difficult to fertilize and manage. Capability unit VIIs–2; woodland suitability group 9.

Andover very stony loam, 8 to 25 percent slopes (AoC).—This moderately sloping to moderately steep soil is at the base of mountains in the Ridge and Valley province, mostly in seep spots near the Buchanan and Laidig soils. The largest area is in the eastern part of Sugar Valley east of Carroll, but small areas are scattered throughout the Ridge and Valley province. The subsoil is similar to that of the profile described for the series in permeability, in moisture available for plants, and in acidity.

Steeper slopes make management of this soil more difficult than that of the soil described. All of the acreage is in trees, mainly white pine, hemlock, elm, and maple. Rhododendron forms the understory in many places, but the plant cover in small, open areas is sedges, bluegrass, and weeds. Capability unit VIIs–2; woodland suitability group 9.

Ashton Series

The Ashton series consists of deep, mellow, well-drained, dark grayish-brown soils that are slightly undulating and gently sloping. These soils formed on stream terraces of the Susquehanna River east of Lock Haven and along the major streams that drain Nittany and Sugar Valleys. They are flooded occasionally.

The surface layer is 10 to 15 inches of very dark grayish-brown, granular silt loam that contains numerous roots and a few pebbles. The upper part of the subsoil is 18 to 22 inches of dark-brown or reddish-brown light silt loam that has fine, blocky structure. It contains numerous roots and wormholes and a few, small, rounded pebbles. The lower part of the subsoil is 17 to 23 inches of dark-brown, blocky silt loam that grades to loam in the lower part. This layer contains a few pebbles. The substratum, a dark-brown fine sandy loam, is 17 to 20 inches thick.

The Ashton soils are near the well-drained Huntington and the moderately well drained Lindside soils. They

are also near the somewhat poorly drained Newark and the poorly drained Melvin soils. They have a more distinct subsoil than the Huntington soils and are leached to a greater depth. Also, they are at higher elevations than those soils and are flooded less frequently.

The texture of the surface layer of Ashton soils ranges from silt loam to sandy loam, but silt loam is dominant. In small depressions the texture of the surface layer is silt loam, but in areas along streambanks it is sandy loam. Some small areas along Fishing Creek in Nittany and Sugar Valleys have a cobbly surface layer.

Ashton soils have high moisture-holding capacity for plants. They are moderately acid to neutral throughout the profile. Excess water moves quickly through the soils. Tilth is favorable, and the soils can be worked soon after a rain. The soils dry out early in spring and early crops can therefore be planted on them.

These soils are very productive of all crops commonly grown in the county. Yields are consistently high if the content of organic matter and the supply of plant nutrients are kept high.

Ashton silt loam (As).—This is the only Ashton soil mapped in the county. It is nearly level and slightly undulating and is in the bottom lands (fig. 5). Its profile is the one described for the series.

Figure 5.—**Typical landscape of Ashton silt loam on Great Island below Lock Haven.**

This soil has moderate to moderately rapid permeability to water. It is permeable to plant roots to a depth of 36 inches or more. The moisture-holding capacity for plants is high. This soil is slightly acid to nearly neutral. Crops on it respond well if fertilizer is added.

This soil is one of the most productive in the county. Generally, yields of potatoes, tobacco, corn, and other field crops are high. Only small amounts of lime are needed to correct acidity. A crop rotation of high intensity can be used. If crop residues are returned to the soil and cover crops are grown to help maintain organic matter and tilth, corn can be grown continuously. Capability unit I–3; woodland suitability group 2.

Atkins Series

In the Atkins series are deep, poorly drained to somewhat poorly drained, brownish, level to nearly level soils. These soils formed on flood plains of streams north of Lock Haven, mainly in material washed from soils of the uplands that are underlain by acid sandstone and shale. They generally are in abandoned channels that still receive overflow or are in low areas at the base of upland slopes. Black alder, red maple, elm, elderberry, and yellow birch make up the native vegetation.

The surface layer is 8 to 11 inches of dark grayish-brown, friable silt loam. It contains many roots and wormholes and some brownish mottles. It is generally medium acid. The lower part of the surface layer is dark-brown, friable silt loam 4 to 7 inches thick. It has a few, yellowish-brown mottles and is strongly acid.

The upper part of the subsoil is olive-gray, friable silt loam 18 to 22 inches thick. This layer has many, prominent mottles of strong brown. It is slightly sticky and plastic when wet and is strongly acid. The upper part of the substratum is 16 to 36 inches of gray silty clay loam and contains prominent mottles of strong brown. It is sticky and plastic when wet and is strongly acid. The lower part of the substratum is stratified gravel and sand and is at a depth of 48 to 72 inches.

These soils are near the well-drained Pope soils. They are coarser textured and more acid than the Melvin soils.

Because of the high water table, water moves very slowly through these soils. They generally remain wet until late in spring. If the areas can be drained, they are highly productive. Overflow from periodic floods, however, destroys some crops each year.

These soils are mostly in woodland and pasture. Hickory, elm, willow, sycamore, alder, red maple, and elderberry grow well on these soils, and sedges and mosses are common. Reed canarygrass and other crops that tolerate wetness are suitable plants for areas of Atkins soils that have not been drained.

Atkins silt loam (At).—This is the only Atkins soil mapped in the county. It is level to nearly level and is on flood plains. Its profile is the one described for the series.

The surface layer of this soil is high in organic matter, but the water table remains near the surface for long periods and excess water makes productivity low. Because of frequent floods, crops are damaged each year.

Generally, this soil cannot be drained easily, because it is near the level of a permanent stream. Use of tile drains and terraces are not feasible, because of lack of proper outlets. Surface drainage, such as bedding, helps improve yields. If the soil is properly drained, yields are good. Capability unit IIIw–3; woodland suitability group 11.

Barbour Series

The Barbour series consists of deep, well-drained, reddish soils that are nearly level and gently undulating. These soils formed on flood plains of streams that drain soils in the uplands. They are underlain by a mixture of acid red and gray sandstone and shale.

The surface layer is 8 to 10 inches of dark-brown, friable, granular fine sandy loam. This layer contains numerous

plant roots. The upper part of the substratum is a yellowish-red or reddish-brown, strongly acid loam or sandy loam 20 to 30 inches thick. It contains a few pebbles. The lower part of the substratum is reddish-brown, loose sandy loam or loamy sand that is very strongly acid.

The texture of the surface layer is loam, silt loam, or sandy loam. Lenses of sand, clay, or silt occur throughout the profile. The color of the substratum ranges from red to reddish brown. The content of gravel in the profile varies.

Barbour soils are near the moderately well drained to somewhat poorly drained Basher soils and the poorly drained to somewhat poorly drained Atkins soils. They are redder throughout the solum than the Pope soils and contain less coarse gravel. They are better drained than the Basher soils.

Permeability of the Barbour soils to water and plant roots is good. The moisture-holding capacity is high. These soils are moderately acid to strongly acid. Crops on them respond well if fertilizer is applied.

Barbour soils are highly productive. They periodically receive overflow, but crops are not seriously damaged.

Barbour fine sandy loam (Ba).—This is the only Barbour soil mapped in the county. It is nearly level and is on flood plains of streams that drain areas of red soils in the uplands. Its profile is the one described for the series.

This soil is permeable to plant roots and water and has high moisture-holding capacity for plants. It is moderately acid.

Crops on this soil respond well if fertilizer is applied frequently, especially if fertilzer high in potassium is added. The soil is well suited to alfalfa. A crop rotation of high intensity can be used if crop residues that help maintain organic matter are returned to the soil. Applying moderate amounts of lime helps correct acidity. Capability unit I–4; woodland suitability group 1.

Basher Series

The Basher series consists of deep, moderately well drained to somewhat poorly drained, nearly level soils. These soils formed in alluvium on flood plains of small streams throughout the mountainous part of the county. They are underlain by acid red sandstone, siltstone, and shale.

The plow layer is 7 to 9 inches of very dark grayish-brown, friable silt loam. It is slightly sticky when wet and is slightly acid. Reddish-brown, friable silt loam 8 to 11 inches thick makes up the upper part of the substratum. This layer is strongly acid. The lower part of the substratum is reddish-brown silt loam that has brown and dark-brown mottles. This layer contains a few lenses of sand and clay and is strongly acid.

The surface layer is mostly silt loam, but in some small areas it is fine sandy loam, gravelly sandy loam, or loam. The texture of the subsoil is silt loam, fine sandy loam, sandy loam, loamy fine sand, or sandy clay loam, and all of these are stratified in places. Depth to mottling ranges from 12 to 36 inches. In some areas there are pockets of gravel and sand and a few boulders.

Basher soils are near the well-drained Barbour soils and the poorly drained Atkins soils. They are redder than the Lindside soils and are more acid throughout the solum.

Basher soils have high available moisture holding capacity. They are easy to cultivate and can be tilled early in spring. These soils are flooded nearly every year but generally not in the growing season. A high water table, which is present part of the year, restricts growth of roots.

Basher soils are suited to most crops grown in the county and are highly productive. Alfalfa grows moderately well.

Basher fine sandy loam (Bb).—This nearly level and gently undulating soil is on flood plains of streams. The surface layer and subsoil are sandier than those in the profile described for the series.

Permeability to plant roots and water is good during the growing season. The moisture-holding capacity for plants is high. Crops on this soil respond well if fertilizer is applied.

This soil is suited to all crops commonly grown in the county, and yields are high. Alfalfa grows moderately well. If crop residues that help maintain the content of organic matter are returned to the soil, a crop rotation of moderately high intensity can be used. Capability unit IIw–3; woodland suitability group 9.

Basher silt loam (Bc).—This nearly level soil is on flood plains of streams. Its profile is the one described for the series.

Permeability to moisture and plant roots is moderate during the growing season. The moisture-holding capacity for plants is high. Crops on this soil respond well if fertilizer is added.

This soil is suited to all crops commonly grown in the county. Alfalfa grows moderately well. Yields are high if the soil is well managed. If crop residues that help maintain organic matter are returned to the soil, a crop rotation of moderately high intensity can be used. Lime and fertilizer should be applied according to the results of soil tests and the needs of the crop. Capability unit IIw–3; woodland suitability group 9.

Berks Series

In the Berks series are moderately deep to shallow, well-drained, brownish, nearly level to very steep soils. These soils are on the shale hills. They formed in material from hard, acid, gray and brown shale and contain many fragments of shale and some fragments of sandstone.

The surface layer is 1 to 3 inches of dark-brown, friable shaly silt loam. This layer contains a few to many, fine, hard chips and fragments of channery shale and is very strongly acid. Below is 5 to 7 inches of pale brown and very pale brown, friable shaly silt loam that is strongly acid. Many fine chips of shale and some small fragments of channery sandstone are in this layer. In cultivated areas plowing has mixed these two layers, and the resulting plow layer is dark grayish-brown, friable shaly silt loam.

Brown, friable shaly silt loam 9 to 14 inches thick makes up the subsoil. This layer contains many fine chips of shale and fragments of channery sandstone and is strongly acid. The substratum is a loose mass of shattered shale 5 to 16 inches or more thick. Brown and dark grayish-brown soil films occur in places. The underlying rock is made up of fine-grained sandstone and of moderately thick beds of tilted shale.

Depth of the soil over shale ranges from 10 to 30 inches.

The deeper soils are at the base of slopes, and the very shallow areas are on the brow of hills.

Berks soils have moderately rapid permeability, and roots of plants penetrate into the bedrock. Their moisture-holding capacity for plants is low, and distance to the water table is great. These soils warm up early in spring and are among the first on which pastures show green. They are easy to till, and a seedbed is easy to prepare in them, but they erode readily.

These soils produce moderate to low yields of the crops commonly grown in the county. Crops on these soils are likely to be damaged by drought quickly in summer. They respond well if fertilizer is added but only if enough moisture is available. Small grains grow well on these soils. Yields of all row crops that mature late are lowered by lack of moisture during dry periods.

On fields of these soils that are left idle, goldenrod, dewberry, blackberry, cinquefoil, broomsedge, wild strawberry, and other weeds begin to grow in that order. Staghorn sumac and few Virginia pine and aspen grow after a few years. Pine and aspen increase in number and eventually are dominant in the stand.

Berks channery silt loam, 3 to 8 percent slopes, moderately eroded (BeB2).—This moderately sloping soil is on the shale hills. On the average, the soil is 4 to 8 inches thicker than that described as typical of the Berks soils.

Most of the original surface layer has been removed through erosion. The present surface layer is a mixture of material from the subsoil, material remaining from the surface layer, and chips of shale. Chips of shale and small fragments of sandstone are numerous throughout the profile, but these do not hinder plowing, cultivating, or seeding.

In a few small areas this soil is as much as 30 inches deep, and a few small areas are only slightly eroded.

Crops on this Berks soil respond well if fertilizer is added. Nevertheless, the soil has low moisture-holding capacity, and drought, even of short duration, seriously affects crop yields. Moderate to high yields of small grains are produced, but high yields of corn can be expected only if enough moisture is available throughout the growing season. A crop rotation of moderate intensity is suitable. Diversion terraces, used with contour or graded strips, are needed for control of runoff and to reduce erosion. Capability unit IIe–5; woodland suitability group 5.

Berks channery silt loam, 8 to 15 percent slopes, moderately eroded (BeC2).—This moderately sloping soil is on the shale hills. Depth to hard rock is greater than in the profile described as representative for the series. In most places about half, or more, of the surface layer has been removed through erosion. Shale chips and channery fragments are numerous in the soil.

This soil is easy to cultivate, but its moisture-holding capacity is low, and runoff is rapid.

Most crops grown in the county are not suited to this soil. Yields of small grains and row crops are poor and are lowered greatly during periods of drought. A crop rotation of low intensity is needed. Diversion terraces and contour strips can be used for control of runoff. Capability unit IIIe–4; woodland suitability group 5.

Berks channery silt loam, 15 to 25 percent slopes (BeD).—This moderately steep soil is on the shale hills between Beech Creek and Avis. The coarse fragments in this soil are larger than those in the profile described as representative for the series and the soil is more strongly acid.

Permeability of this soil to water and plants is good, but the moisture-holding capacity is low. Runoff is generally slight, but during heavy showers it increases considerably. If enough moisture is available, crops on this soil respond well when fertilizer is added.

This soil is in undisturbed woodland. If this soil is cultivated, a suitable rotation is 1 year of row crops and 4 years of hay. Birdsfoot trefoil is well suited. The cultivated crops, hay, and pasture should be seeded in contour strips protected by terraces. Capability unit IVe–4; woodland suitability group 5.

Berks channery silt loam, 15 to 25 percent slopes, moderately eroded (BeD2).—This moderately steep soil is on the shale hills between Beech Creek and Avis. Its surface layer is 3 to 6 inches thick and contains numerous shale chips and channery fragments. In wooded areas this layer has a thin cover of decayed leaves and twigs.

This soil is permeable to water and plant roots, but capacity for holding water that plants can use is low. During heavy storms runoff is rapid.

This soil is suited to hay, pasture, or trees. Birdsfoot trefoil is also well suited. Reseeding of hay and pasture should be done in contour strips. Capability unit IVe–4; woodland suitability group 5.

Berks channery silt loam, 25 to 35 percent slopes (BeE).—This steep soil is in wooded areas on the shale hills. In color and texture, the surface layer is similar to that in the profile described as representative for the series. It is several inches thinner, however, and the depth of the soil is 4 to 6 inches less. Channery fragments are also more numerous in most places.

Included with this soil are areas of a deeper soil that were too small to be mapped separately.

Berks channery silt loam, 25 to 35 percent slopes, is low in fertility and is droughty. Runoff is rapid.

Most areas of this soil are used as pasture or woodland. Reseeding of pasture should be done in contour strips. Capability unit VIe–2; woodland suitability group 7.

Berks channery silt loam, 25 to 35 percent slopes, moderately eroded (BeE2).—This steep soil is on ridges and side slopes of the shale hills. The surface layer is 6 to 10 inches thinner than that in the profile described as representative for the series. It is 4 to 6 inches thick and contains numerous fragments of sandstone.

Included with this soil are areas of deeper soils that were too small to be mapped separately.

Berks channery silt loam, 25 to 35 percent slopes, moderately eroded, is droughty and is low in fertility. During periods of intense rainfall, runoff is rapid.

This soil is best suited to pasture or trees. Reseeding of pasture should be done in contour strips. Capability unit VIe–2; woodland suitability group 7.

Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded (BkB2).—This moderately sloping soil is in shale areas at the base of mountains in the limestone valleys. The surface layer is 4 to 6 inches thick and contains many shale chips. Numerous shale chips occur throughout the profile, but these do not hinder plowing, cultivating, or seeding.

Included with this soil in mapping are a few small, nearly level areas of Berks soils.

Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded, has poor moisture-holding capacity. Crops on this soil respond well, however, if fertilizer is applied. Drought, even of short duration, seriously lowers crop yields. Moderate to moderately high yields of small grains are produced, but fairly high yields of corn can be obtained only if enough moisture is available during the growing season. A crop rotation of moderate intensity is needed. Diversion terraces, used with contour strips, are needed for the control of runoff and to reduce erosion. Capability unit IIe–5; woodland suitability group 5.

Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded (BkC2).—This moderately sloping soil is in the shale areas at the base of mountain slopes of the limestone valleys. The surface layer is 4 to 5 inches thick and contains many shale chips. Numerous shale chips also occur throughout the profile. Depth to hard rock is greater than in the profile described as representative for the series.

This soil has low moisture-holding capacity. Crops on it respond rapidly if lime and fertilizer are applied, but the response does not last long. Therefore, it is desirable to add plant nutrients frequently and in small amounts. This soil is easy to till but erodes readily. Runoff is rapid.

If average management is used, yields of small grains and row crops are moderate to low. Generally, droughts in summer greatly lower crop yields. Diversion terraces and contour strips are needed for the control of runoff. Capability unit IIIe–4; woodland suitability group 5.

Berks shaly silt loam, 15 to 25 percent slopes (BkD).—This moderately steep soil is in shale areas at the base of mountains in the limestone valleys. Its profile is the one described for the series.

Permeability of this soil is good, but moisture-holding capacity for plants is low. Runoff is rapid.

This soil is wooded. It is well suited to trees, permanent hay, or pasture. Birdsfoot trefoil is an excellent legume to grow for hay or pasture. A suitable rotation if cultivated crops are grown, is 1 year of a row crop, 1 year of a small grain, and 4 years of hay. Reseeding should be done in contour strips. If it is feasible, diversion terraces can be installed for control of runoff and to reduce erosion. Capability unit IVe–4; woodland suitability group 5.

Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded (BkD2).—This moderately steep soil is in the shale areas at the base of mountains in the limestone valleys. It is not so deep as the soil described as representative for the series. Chips of shale are numerous.

Permeability of this soil to moisture and plant roots is moderate. The moisture-holding capacity is low, and runoff is rapid. Erosion is the principal hazard. Cultivated crops should be held to a minimum on these soils. A suitable rotation is 1 year of a row crop, 1 year of a small grain, and 4 years of hay.

Birdsfoot trefoil is an excellent legume for hay and pasture. Reseeding of hay and pasture should be done in contour strips. Diversion terraces, where they can be installed, are needed for control of runoff. Capability unit IVe–4; woodland suitability group 5.

Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded (BkE2).—This steep soil is in shale areas at the base of mountains in limestone valleys. Its profile is more shallow than that described as representative for the series. Numerous shale chips and sandstone fragments are on the surface and in the subsoil. The soil has low to very low moisture-holding capacity and is very droughty.

Included with this soil in mapping are small areas of a steep, severely eroded Berks shaly silt loam.

Most of Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded, is wooded mainly with white pine and chestnut oak but partly with white oak, red oak, and juneberry. Generally, this soil is better suited to pasture and trees than to row crops. Capability unit VIe–2; woodland suitability group 7.

Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded (BmB3).—This complex consists of about equal acreages of Berks and Montevallo soils. The areas are so intermingled that they cannot be mapped separately. These gently sloping soils are on the shale hills east and west of Lock Haven. A typical profile of a Montevallo soil is described under the Montevallo series.

Nearly all of the original surface layer of these soils has been lost through erosion. The present surface layer consists of material from the subsoil that has been mixed with the remaining surface layer and organic matter. The soils contain many shale chips and channery fragments, and these cover the surface in many places. The moisture-holding capacity is low, and runoff is rapid.

The soils in this complex are poorly suited to crops. They cannot keep enough water available for plants in dry periods, and necessary plant nutrients are therefore not available. Except for hardy birdsfoot trefoil, all forage crops generally stop growing during droughts. Yields of grain crops are generally low, and corn seldom yields a paying crop.

A cropping system of low intensity is needed on these soils. Grain should be seeded in contour strips. Diversion terraces and contour or graded strips are needed for control of runoff and to reduce erosion. Capability unit IVe–4; woodland suitability group 12.

Berks-Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded (BmC3).—These moderately sloping soils are on the shale hills. Typically, they are on the brow of the slope, or where the slopes break from gently sloping to steep.

The soils in this complex have lost all or nearly all of the original surface layer and some of the subsoil. Yellow and yellowish-brown, very shaly material that was originally subsoil is now exposed. In a few places gullies have cut into the subsoil.

These soils are droughty and have low moisture-holding capacity. Yields of nearly all crops are poor. The soils are best suited to pasture or woodland. Diversion terraces and permanent cover are needed. Reseeding should be done in contour or graded strips. Capability unit VIe–2; woodland suitability group 12.

Berks-Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded (BmD3).—These moderately steep soils are on the shale hills. Nearly all of the surface layer, and in places some of the material from the subsoil, has been removed by erosion. Shale chips and sandstone fragments are numerous. Shale bedrock outcrops in places, and in a few places gullies have cut into the substratum. These soils are droughty, have low moisture-holding capacity, and are low in fertility. Large areas are bare. These soils are best suited to trees. Capability unit VIIe–1; woodland suitability group 12.

Berks-Montevallo channery silt loams, 35 to 100 percent slopes (BmF).—These very steep soils are mostly on the shale hills between Beech Creek and Pine Creek. A few small areas are in the shale areas surrounding the limestone valleys. The solum ranges from very shallow to shallow.

These soils are droughty and low in fertility. They are used as woodland and are best suited to this use. Capability unit VIIe–1; woodland suitability group 12.

Berks-Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded (BmF2).—These very steep soils are on the sides of the shale hills between Beech Creek and Pine Creek. Their surface layer is 1 to 3 inches of mixed organic matter, fine soil material, and many fragments of shale and fragments of channery sandstone. The amount of fine soil material between the fragments is small.

These soils have rapid permeability and low moisture-holding capacity and are low in fertility. They are best suited to woodland. Capability unit VIIe–1; woodland suitability group 12.

Brinkerton Series

The Brinkerton series consists of poorly drained, nearly level to gently sloping, brownish, silty soils. These soils are in swales on the shale hills between Pine Creek and Beech Creek. They formed in material weathered from a mixture of shale and sandstone.

The plow layer is 5 to 8 inches of brown silt loam that contains a few small fragments of sandstone, shale, and quartzite. It is medium acid. The subsoil is light grayish-brown clay loam 9 to 14 inches thick. It contains many mottles of light gray and yellowish brown, which are at a depth of 5 to 8 inches. This layer is firm when moist but is sticky and plastic when wet. It is extremely acid. At a depth of about 20 inches, the subsoil is very firm sandy clay that consists of 10 to 20 percent of fragments of shale, quartzite, and sandstone. The subsoil rests directly on the underlying rock, which usually is a thin bed of acid shale.

Depth to hard rock ranges from 2½ to 10 feet. In places the bedrock consists of Catskill red shale, of brown Chemung shale, or of dark-colored shale. The amount of sandstone, quartzite, shale, and gravel ranges from 5 to 20 percent of the volume.

Brinkerton soils are near the deep, well-drained Allenwood soils and the moderately well drained Watson soils. They are redder than the Nolo soils and have a finer textured subsoil.

These soils are low in productivity and are difficult to till. They are wet, and water filters through them very slowly. Late in summer they dry out and become hard and hold little water available for plants. In other periods there is too much water, and most crops drown out. A few areas are fed by springs, and here the soils are always wet. If these soils are not drained, crops on them respond poorly even though fertilizer is applied.

Brinkerton soils occupy a small acreage in Clinton County and are not important to agriculture. They are best suited to grasses that tolerate wetness.

Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded (BrA2).—This is the only Brinkerton soil mapped in the county. It is gently sloping and is in swales in the shale uplands. Its profile is the one described for the series. As much as 25 to 75 percent of the surface layer has been removed by erosion.

Included in mapping are a few areas that are steeper than this soil and a few areas that are not eroded.

Excess water is the main hazard on Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded. Consequently, the soil is better suited to reed canarygrass, ladino clover, alsike clover, and other plants that tolerate wetness than to row crops. When farmed, a rotation of low intensity should be used. If feasible, diversion terraces can be installed for control of runoff. In areas that are large enough, graded stripcropping can be used to help reduce erosion. Capability unit IVw–1; woodland suitability group 11.

Buchanan Series

The Buchanan series consists of deep, moderately well drained to somewhat poorly drained, brownish, slightly sloping to sloping soils that have a firm, mottled, gravelly lower subsoil. These soils are in the southern third of the county. They formed in material that was washed from areas of sandstone and shale and that has accumulated at the base of mountains and ridges.

The plow layer is dark-brown, friable gravelly loam 8 to 12 inches thick. Below this is 1 to 4 inches of yellowish-brown, friable gravelly loam that in many places is intermixed with the plow layer. The upper part of the subsoil is yellowish-brown, friable gravelly loam that is 9 to 20 inches thick. The lower part of the subsoil is firm to very firm, yellowish-brown or brown gravelly loam that is 20 to 40 inches thick. It contains many distinct mottles of gray and pale yellow and many, fine to very fine chips of gravel and sandstone. This layer is strongly acid.

The surface layer is gravelly loam or gravelly silt loam. The subsoil is generally brownish. The substratum is coarser textured than the surface layer. Depth to the fragipan ranges from 24 to 36 inches.

The Buchanan soils are near the Laidig and Andover soils. These soils contain more coarse fragments than the Watson soils, and their subsoil is yellowish brown rather than reddish brown like that of the Watson soils.

The Buchanan soils are moderately permeable in the surface layer and upper part of the subsoil and slowly permeable in the lower part of the subsoil and substratum. Their capacity to hold moisture for plants is moderate. Crops on these soils respond moderately well if fertilizer is applied.

These soils are well suited to most crops grown in the county, and yields are moderate. Alfalfa makes moderate yields for 2 to 3 years, but winter grains are likely to freeze out.

Buchanan gravelly loam, 3 to 8 percent slopes (BuB).—This gently sloping soil is at the base of mountains in the limestone valleys. The upper 2 to 4 inches of the surface layer is dark colored, is high in content of organic matter, and in places contains fine fragments of shale and sandstone. The upper part of the subsoil is yellowish-brown gravelly loam that is slowly permeable to water.

Permeability to water and plant roots is good. Runoff is moderately slow. The moisture-holding capacity for plants is high, and crops on this soil respond well if fertilizer is added.

This soil is suited to most crops grown in the county, and alfalfa grows moderately well. In some places winter grains are lost because of frost heaving. A crop rotation of moderate intensity can be used. Wet spots need to be tiled and diversion terraces should be installed for control of runoff and to reduce erosion. Capability unit IIe–4; woodland suitability group 9.

Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded (BuB2).—This gently sloping soil is at the base of mountains in the limestone valley near the Laidig and Murrill soils. Its profile is the one described for the series.

Permeability of this soil to water is moderately slow. Roots penetrate only as deep as the pan. The moisture available for plants during droughts is moderate. Runoff is medium.

Included with this soil in mapping are small, poorly drained areas of Andover soils.

Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded, is suited to most crops grown in the county if a rotation of moderate intensity is used. Alfalfa grows moderately well. Yields of winter grains and alfalfa are reduced somewhat because of frost heaving. Diversion terraces are needed for control of excess water. Capability unit IIe–4; woodland suitability group 9.

Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded (BuC2).—This moderately sloping soil is in areas at the base of mountains in the limestone valleys. It occupies areas that are moderate in size and is important to the agriculture of the county. The surface layer ranges from 4 to 8 inches in thickness. It contains many fragments of sandstone and shale, and in many places these fragments are 8 to 10 inches in diameter. Gravelly clay loam from the subsoil has been mixed with the surface soil by plowing.

This soil has a moderately high capacity to hold moisture for plants. Runoff is medium. Internal drainage is moderate to a depth of 20 to 24 inches but it is slow below that. Erosion is the major hazard.

Included with the larger areas of this soil in mapping are small areas of better drained soils. The Dekalb soils are at higher elevations on the sides of mountains, and Laidig and Murrill soils are in surrounding areas. Seep spots less than an acre in size in this soil are indicated on the detailed soil map by symbols for wet spots.

Shallow-rooted crops are moderately well suited to this Buchanan soil. Deep-rooted crops do not grow well, however, because of wetness in the lower part of the subsoil. Diversion terraces and graded stripcropping are needed for control of excess water and to reduce erosion. Capability unit IIIe–3; woodland suitability group 9.

Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded (BuC3).—This moderately sloping soil is in upland areas at the base of mountains. The surface layer is 2 to 3 inches thick and contains many fragments of sandstone and shale. Depth to the fragipan ranges from 16 to 18 inches.

This soil has moderately slow permeability to water and holds a moderate amount of moisture for plants. Runoff is medium. Erosion is the major hazard.

Included with this soil in mapping are small areas of Watson soils that have slopes of 8 to 15 percent.

Crop rotations that include a few row crops and several years of hay are needed on this Buchanan soil. Diversion terraces can be used for control of excess water. Capability unit IVe–3; woodland suitability group 9.

Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded (BuD2).—This moderately steep soil is at the base of mountains in the limestone valleys. The surface layer, which is 4 to 6 inches thick, contains many fragments of sandstone and shale. Depth to the pan is 16 to 18 inches.

Permeability to water and available moisture for plants are moderate. Runoff is medium. Erosion is the major hazard.

This soil is suited to a rotation of low intensity, or to permanent hay or pasture. Diversion terraces, where it is feasible to install them, are needed for control of excess water. Reseeding should be done in contour strips. Capability unit IVe–3; woodland suitability group 9.

Buchanan very stony loam, 0 to 8 percent slopes (BvB).—This nearly level to gently sloping soil is in the uplands around the sides of the limestone valleys. Its profile is similar to the one described for the series, but this soil has sandstone boulders 15 inches or more long that are scattered on the surface and throughout the subsoil.

Permeability of this soil to water is good to a depth of 20 to 24 inches. The ability to hold moisture for plants is high.

Most areas of this soil have a protective cover of trees; small areas are pastured. This soil is moderately productive, but the numerous large stones make it poorly suited to crops. The soil is therefore best suited to pasture or trees. Capability unit VIs–2; woodland suitability group 9.

Buchanan very stony loam, 8 to 25 percent slopes (BvC).—This moderately sloping soil is in the uplands around the sides of the limestone valleys. Its profile is similar to the one described for the series, but this soil has steeper slopes and sandstone boulders 15 inches or more long scattered on the surface and throughout the subsoil.

Permeability of this soil to water and plant roots is good to a depth of 20 to 24 inches. The moisture-holding capacity for plants is high.

Many large stones make this soil unsuited to crops. The soil is therefore best suited to pasture and trees. Capability unit VIs–2; woodland suitability group 9.

Cavode Series

The Cavode series consists of deep, somewhat poorly drained soils that are nearly level and gently sloping. These soils have a claypan, or impermeable layer, in the lower part of the subsoil. They formed on tablelands in the Allegheny Plateau part of the county.

The plow layer consists of 7 to 9 inches of dark grayish-brown silt loam. In undisturbed wooded areas the surface layer is 1 to 2 inches of dark-brown silt loam underlain by 5 to 7 inches of yellowish silt loam.

The upper part of the subsoil is 8 to 10 inches of brown, sticky and plastic silty clay loam that is medium acid to strongly acid. This layer has distinct, strong-brown mottles in the lower part. It contains a few chips of shale and a moderate number of fine roots in places. The lower part of the subsoil is 16 to 20 inches of yellowish-brown, sticky and plastic silty clay loam. It is very strongly acid and contains a few roots. The substratum is brown and dark yellowish-brown, firm silty clay loam. This layer con-

tains coatings of light gray and streaks of strong brown and numerous coarse fragments of sandstone. It is very strongly acid.

These soils range from 42 to 72 inches in depth. Depth to the claypan ranges from 12 to 18 inches. In places the soils contain a small amount of red shale.

These soils are mostly near the Gilpin soils. They are better drained than the Nolo soils and are finer textured. They are finer textured than the Cookport soils but lack the very firm subsoil of those soils.

Cavode soils have moderately high moisture-holding capacity for plants. Downward movement of plant roots and water is restricted by the firm claypan. These soils warm up late in spring and become wet when rainfall is moderate to high. If the soils are pastured during wet periods, trampling by the cattle causes the soils to puddle.

These soils are poorly suited to deep-rooted crops and to winter grains. White pine, maple, basswood, and elm are the dominant trees. There are also a few white and red oaks.

Cavode silt loam, 0 to 3 percent slopes (CaA).—This nearly level soil is on small saddles of tableland in the Allegheny Plateau part of the county, mostly in the northwestern part. It is more poorly drained than the soil described for the series because of slower runoff as well as slow internal drainage. Also, mottles are several inches nearer the surface. Seep spots and small wet areas are common. During droughts the moisture-holding capacity for plants is moderately low; consequently, 2 weeks of drought seriously affect plant growth.

Included with this soil in mapping are small areas of wetter soils.

Tile drains can be used in wet spots of Cavode silt loam, 0 to 3 percent slopes, to remove excess water and thus improve the tilth of the soil. Capability unit IIIw–1; woodland suitability group 9.

Cavode silt loam, 3 to 8 percent slopes (CaB).—This gently sloping soil is in the Allegheny Mountain section of the county in the west-central, northwestern, and east-central parts. Its profile is the one described for the series.

Permeability to water is moderate in the surface layer and slow in the subsoil. The moisture-holding capacity for plants is moderately low; consequently, 2 weeks of drought seriously affect plant growth. This soil is moderately acid to strongly acid. Crops on it respond slowly if lime and fertilizer are added, but the fertility can be increased gradually. This soil dries slowly in spring, and early crops cannot be planted on it at the proper time. Furthermore, the soil becomes saturated during periods of excessive rainfall.

Included with this soil in mapping are small areas of soils that are more poorly drained than this soil.

A crop rotation of moderate intensity is needed on this Cavode soil. Diversion terraces and graded stripcropping help to control erosion. Tile drains can be used in wet spots to improve tilth of the soil. Capability unit IIIw 2; woodland suitability group 9.

Chenango Series

In the Chenango series are deep, nearly level to gently rolling, well-drained, yellowish-brown, gravelly soils. These soils are on high terraces along Pine Creek. They formed in material from sandy and gravelly alluvium.

The plow layer is dark-brown, very friable gravelly loam 7 to 10 inches thick. Beneath this is 3 to 7 inches of dark yellowish-brown gravelly loam. The lower part of the subsoil is dark-brown to reddish-brown, friable gravelly loam 12 to 24 inches thick. This layer contains numerous rounded pebbles ½ to 6 inches in diameter. The substratum is weakly stratified sand and gravel that in places extends to 8 feet or more. A profile of a Chenango gravelly loam is shown in figure 6.

Figure 6.—**Profile of a Chenango gravelly loam exposed in foundation excavation along Pine Creek north of Avis. The numbers on the tape indicate depth in feet; lines are at 3-inch intervals.**

Depth to stratified sand and gravel ranges from 12 to 48 inches. The color of the subsoil ranges between dark yellowish brown and reddish brown.

The Chenango soils occupy nearly all of the terrace on the west bank of Pine Creek north of Avis. A small area of poorly drained Brinkerton soil is at the base of the hill above the terrace. Allenwood, Watson, and Montevallo soils are on the glaciated hills to the west.

These soils hold moisture for plants moderately well. Crops on them respond well if fertilizer is added.

Chenango soils are well suited to all crops commonly grown in the county. Alfalfa and other deep-rooted crops are also well suited.

Chenango gravelly loam, 0 to 3 percent slopes (ChA).—This nearly level soil is on the terrace plain north of Avis (fig. 7). Its profile is similar to the one described for the series, but it is deeper, and the surface layer contains fewer and smaller pebbles. The surface layer is 8 to 10 inches thick.

This soil dries out rapidly after a rain. It can be plowed without compacting or otherwise damaging it. The

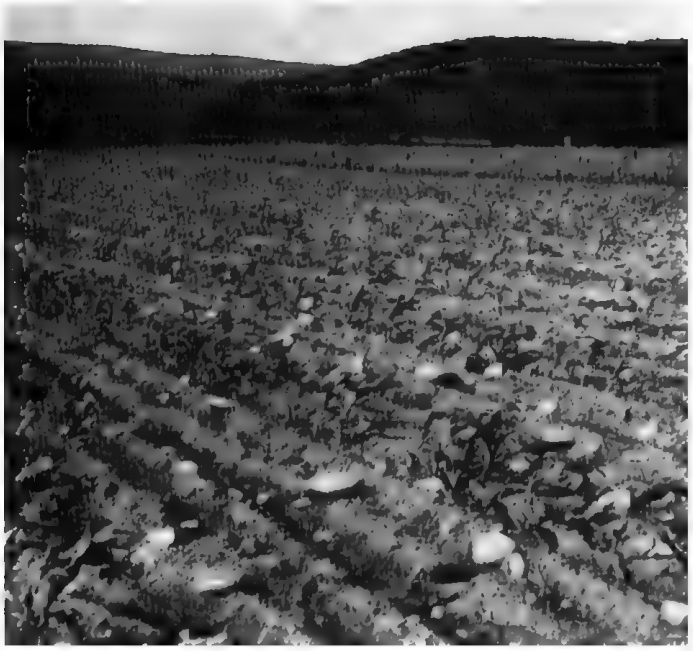

Figure 7.—Typical landscape of a Chenango gravelly loam along Pine Creek north of Avis in fields of corn and alfalfa.

moisture-holding capacity for plants is high. Crops on this soil respond well if fertilizer is added.

Except for areas used for homesteads, all of this soil is cultivated. The soil is suited to all crops commonly grown in the county, and alfalfa grows well. Yields are high. Capability unit IIs–2; woodland suitability group 1.

Chenango gravelly loam, 3 to 8 percent slopes (ChB).—This gently sloping soil is at the upper end of the terrace 2 miles north of Avis. Its profile is the one described for the series. Slopes are short and broken and average about 4 percent. Water infiltrates this soil rapidly. As a result, runoff is negligible.

Some of this soil is in woodland made up of maple, hickory, pin oak, and white pine. On idle land the plant cover is goldenrod, dewberry, wild carrot, and timothy. If this soil is cultivated, a rotation of 1 year each of a row crop, a small grain, and hay is needed for the control of erosion and to help maintain fertility. Also, farming should be in strips parallel to the general slope. Capability unit IIe–2; woodland suitability group 1.

Comly Series

The Comly series consists of deep, moderately well drained to somewhat poorly drained, nearly level to moderately sloping, brownish soils that have a firm, compact subsoil. These soils are in depressions and on benches in the brown shale hills between Beech Creek and Pine Creek. They formed on old glacial till derived from dark-gray or brown, moderately hard shale.

The plow layer is dark grayish-brown, friable silt loam 8 to 11 inches thick. This layer contains a few shale chips and numerous roots.

The upper part of the subsoil is yellowish-brown, friable silty clay loam 8 to 11 inches thick. It contains a few roots and some shale chips. The lower part of the subsoil is 6 to 12 inches of yellowish-brown, very firm silt loam that is very slowly permeable to water. The parent material is yellowish-brown, very firm loam mixed with shale fragments. The fragments make up as much as 30 percent of the volume.

The texture of the surface layer is generally silt loam or shaly silt loam. The texture of the subsoil is silty clay loam or silty clay. Depth to the fragipan ranges from 16 to 24 inches, and depth to bedrock from 3 to 5 feet. Fine fragments of shale and sandstone make up from 1 to 40 percent of the volume.

Comly soils are near the well-drained, moderately deep Hartleton soils and the shallow, well-drained Montevallo soils. They do not have the darker brown color, the fine-textured subsoil, or the fragments of sandstone and quartzite that are typical of the Watson soils.

The Comly soils erode readily. The lower part of their subsoil is slowly permeable and restricts internal movement of water. As a result, the soils do not warm up early in spring and are seepy. Winter grains freeze out. These soils are medium acid to strongly acid.

Alfalfa and similar deep-rooted crops grow poorly on these soils. The main plants in woodland are red maple, white pine, Virginia pine, hemlock, chestnut oak, dogwood, and juneberry.

Comly silt loam, 0 to 3 percent slopes (CmA).—This nearly level soil is on the shale hills. The surface layer generally contains fewer shale chips than that of the profile described for the series, and the mottled layer is several inches nearer the surface.

The moisture available for plants during droughts is moderately low. Runoff and drainage of water through the profile is moderately slow. This soil is wet 1 or 2 weeks longer in spring than well-drained soils, and winter grains are more likely to freeze out.

Included with this soil in mapping are small areas of a soil that is somewhat poorly drained.

If Comly silt loam, 0 to 3 percent slopes, is cultivated, diversion terraces are needed for removing excess water and tile should be used to drain wet spots. Farming should be parallel to the diversion terraces or on a slight grade for the control of erosion. Farming this soil exactly on the contour holds back too much water and makes the soil wetter than normal. Capability unit IIw–2; woodland suitability group 9.

Comly silt loam, 3 to 8 percent slopes, moderately eroded (CmB2).—This gently sloping soil is on ridgetops and benches of the shale hills. Its profile is the one described for the series.

The available moisture for plants during droughts is low. Runoff is moderate, but movement of water through the soil is moderately slow. On slopes facing south this soil dries out several days later in spring than well-drained soils, but on slopes facing north it dries out a week or 10 days later.

Included with this soil in mapping are small areas of slightly eroded Comly soils and areas of wetter soils.

If enough lime and fertilizer are added, moderate yields of most crops are made on this Comly soil. Yields of alfalfa and similar deep-rooted crops are moderately high, but yields of winter grains are lowered by winterkilling or frost heaving. Diversion terraces and graded strips are needed for control of runoff. A suitable 3-year rota-

tion includes 1 year of a row crop and at least 1 year of hay. Capability unit IIe–4; woodland suitability group 9.

Comly silt loam, 8 to 15 percent slopes, moderately eroded (CmC2).—This moderately sloping soil is on the shale hills between Pine Creek and Beech Creek, generally in small areas at the base of slopes. Erosion has removed as much as 25 to 75 percent of the surface layer. Shale chips are more numerous on the surface, and the depth to underlying material is less than in the profile described for the series. Also, the slope is steeper. Runoff is rapid, and wetness on this soil is probably caused by seepage from adjacent slopes.

Included with this soil in mapping are small areas of a somewhat poorly drained soil.

A suitable crop rotation for this Comly soil should include at least 2 years of hay. Diversion terraces and graded stripcropping are needed for the control of erosion. Tile drains can be used to drain seep spots. Capability unit IIIe–3; woodland suitability group 9.

Cookport Series

The Cookport series consists of moderately deep to deep, moderately well drained to somewhat poorly drained, nearly level to strongly sloping soils that have a fragipan. These soils are on broad ridgetops of the Allegheny Plateau in the northern half of the county. They formed in material derived from acid sandstone and siltstone.

The surface layer is composed of several layers. The upper 1 or 2 inches is black, loose, friable loam that is very strongly acid. It is underlain by 1 to 4 inches of light brownish-gray, very friable, very strongly acid loam that contains numerous sandstone fragments. Below this is 2 to 5 inches of yellowish-brown, friable sandy loam that is very strongly acid. The total thickness of the surface layers ranges from 5 to 10 inches.

The upper part of the subsoil is 12 to 18 inches of yellowish-brown, friable fine gravelly clay loam that is strongly acid. The lower part of the subsoil is dark yellowish-brown, firm to very firm gravelly sandy loam that is also strongly acid. This layer contains many mottles of yellowish brown and light brownish gray. The substratum is dark-brown, firm to very firm gravelly sandy loam that is strongly acid. Mottles are generally lacking, but in a few places the peds have black coatings. The material in the substratum is like decomposed concrete and is as difficult to work. It contains many stone fragments ½ to 10 inches or larger in diameter. The material underlying this layer is mostly hard, gray acid sandstone, but in places it is shale.

The texture of the surface layer is loam, sandy loam, very stony sandy loam, or silt loam. Where the material was derived from a large amount of shale, the texture of the subsurface layers is as fine textured as clay loam in a few places. The subsoil is dominantly yellowish brown, but in some places where red shale outcrops it is yellowish red. Depth to the fragipan ranges from 16 to 24 inches. The slope is mainly 2 to 7 percent, but in a few areas it ranges to 25 percent.

The Cookport soils are near the well-drained Dekalb and Hartsells soils. Small areas of poorly drained Nolo soils are in the wetter spots of these soils. The Cookport soils are deeper than the Dekalb soils and are not so well drained. Also, they are not so well drained as the Hartsells soils.

These soils are moderately permeable in their surface layer and in the upper part of the subsoil. Permeability of water through the lower part of the subsoil is slow to very slow. The moisture-holding capacity for plants is moderate to moderately high. Excess moisture drains from the soils very slowly. As a result, many areas are waterlogged late in spring. It is impractical to cultivate and plant these soils early in spring, and plants on them bud and flower late. Crops on these soils respond well if lime and fertilizer are added, although the response generally does not last long. Consequently, frequent applications of lime and fertilizer are needed.

Most areas of these soils have not been disturbed by plowing. The soils are well suited to trees, but they are poorly suited to deep-rooted legumes. The dominant trees are white oak, red oak, white pine, soft maple, beech, and hemlock.

Cookport loam, 0 to 3 percent slopes (CoA).—This nearly level soil is in the Allegheny Plateau part of the county. Because of slower runoff, the surface layer is thicker than that in the profile described for the series and the fragipan is nearer the surface. Also, the layer beneath the dark surface layer is a lighter yellow and mottling in the subsoil is more distinct.

This soil dries out late in spring and is waterlogged quickly during periods of excessive rainfall. It holds a moderate amount of moisture for plants. Internal drainage is slow. Crops on this soil respond moderately well if lime and fertilizer are added, but the soil does not hold plant food long.

Deep-rooted plants grow poorly on this soil. Generally much winter grain is damaged by winterkill. Removing excess water is the major problem. Capability unit IIw–2; woodland suitability group 9.

Cookport loam, 3 to 8 percent slopes (CoB).—This gently sloping soil is in the Allegheny Plateau part of the county. Its profile is the one described for the series.

The moisture-holding capacity for plants is moderate. The soil dries out slowly in spring. As a result, preparing the seedbed and planting are delayed. Crops on this soil respond moderately well if lime and fertilizer are added, but the response does not last long, and frequent applications are necessary.

Most of this soil is wooded, but small areas have been cultivated. This soil is suited to most crops grown in the county, though deep-rooted legumes grow poorly and winter grains freeze out. Diversion terraces and graded strips are needed to help remove excess water and control erosion. Capability unit IIe–4; woodland suitability group 9.

Cookport loam, 3 to 8 percent slopes, moderately eroded (CoB2).—This gently sloping soil is in the Allegheny Plateau part of the county in areas used for crops. Plowing has mixed the original surface layers into the present plow layer. In places erosion has removed all but 2 to 4 inches of the original surface layer, and in these places the fragipan is 6 to 8 inches nearer the surface.

Permeability is moderate in the surface layer and upper part of the subsoil but is slow in the lower part of the subsoil. Runoff is medium to rapid; consequently, erosion is a hazard. Because of slow internal drainage, the soil warms up late in spring. Preparation of the seedbed and planting are therefore done late in spring. The soil has

poor to moderate capacity for holding plant nutrients. Crops on it respond moderately well if lime and fertilizer are added, but the response does not last long.

This soil is poorly suited to deep-rooted legumes, and winter grains frequently freeze out. Capability unit IIe–4; woodland suitability group 9.

Cookport loam, 8 to 15 percent slopes (CoC).—This moderately sloping soil is in the Allegheny Plateau part of the county. It is 6 to 12 inches less deep and has more channery fragments on the surface and throughout the profile than the profile described for the series. Also, the lower part of the subsoil, or fragipan, is somewhat nearer the surface, and it is very firm and has fainter mottles.

This soil holds a moderate amount of moisture for plants. Internal drainage is somewhat more rapid than in the less sloping Cookport soils. Runoff is medium. Crops on this soil respond moderately well if lime and fertilizer are added. The response, however, does not last long, and small but frequent applications of lime and fertilizer are needed. A suitable rotation would include 1 year of a row crop and at least 2 years of hay in 4 years.

This soil is poorly suited to deep-rooted crops, and winter grains freeze out. Capability unit IIIe–3; woodland suitability group 9.

Cookport very stony loam, 0 to 8 percent slopes (CpB).—This nearly level to gently sloping soil is in the Allegheny Plateau part of the county. It contains many stones, but its profile is otherwise similar to the one described for the series.

Permeability of this soil to water is moderately slow, and the available moisture-holding capacity for plants is moderately high.

The soil contains many stone fragments that are 15 inches or more long. Machinery cannot be used on it, and intertilling of crops is not feasible. Because of the stones, this soil is better suited to pasture or trees than to row crops. Capability unit VIs–2; woodland suitability group 9.

Cookport very stony loam, 8 to 25 percent slopes (CpC).—This moderately sloping to moderately steep soil is in the Allegheny Plateau part of the county. The soil is 6 inches to 1 foot less deep than the soil described for the series.

Permeability of this soil to water is moderate to a depth of 20 inches, and it is slow below that depth. The moisture-holding capacity is moderately high.

Large fragments of sandstone occupy as much as 15 percent of the surface; consequently, the use of this soil is limited to trees and pasture. Capability unit VIs–2; woodland suitability group 9.

Dekalb Series

In the Dekalb series are moderately deep, well-drained, yellowish-brown, sandy, nearly level to steep soils. These soils generally have many fragments of sandstone throughout the profile. They are on plateaus and on the sides of mountains in the Allegheny Plateau section and the Ridge and Valley province. Dekalb soils formed in material derived mainly from hard gray sandstone but partly from shale.

In wooded areas a litter of hardwood leaves 1 to 2 inches thick covers the surface. Beneath the leaves is ½ to 1 inch of black leaf mold, which is underlain by a thin layer of very dark gray sandy loam. Beneath these layers is yellowish-brown very stony sandy loam 5 to 7 inches thick. In cultivated areas the plow layer is dark grayish-brown sandy loam. The subsoil is 10 to 20 inches of yellowish-brown, friable very stony fine sandy loam or heavy sandy loam. This layer contains a few lenses of sandy clay loam. A thin substratum of brown very stony sandy loam lies above the hard sandstone bedrock.

Dekalb soils range from 14 to 36 inches in depth. The pieces of sandstone in the soils range from a few small fragments to numerous large boulders. The very dark gray or whitish, leached layer beneath the leaf litter ranges from a trace to 4 inches in thickness. The texture of the subsoil ranges from very stony sandy loam to sandy clay loam.

These soils are near the well-drained Hartsells and Leetonia soils, the poorly drained Nolo soils, and the moderately well drained to somewhat poorly drained Cookport soils. They have a thinner, leached surface layer than the Leetonia soils. They are shallower than the Hartsells soils, and their subsoil is less clayey.

These soils are low in plant nutrients and are too shallow and coarse textured to hold much moisture for plants. They are very strongly acid to extremely acid. Crops on these soils respond well if lime and fertilizer are added, but frequent applications are needed.

Most areas of the Dekalb soils are wooded, but some nearly level areas are in crops. The soils are moderately well suited to potatoes if the supply of moisture can be maintained; they are poorly suited to alfalfa. Yields of other crops are low to moderate.

Dekalb channery loam, 0 to 3 percent slopes (DaA).—This nearly level soil is on mountaintops in the Allegheny Plateau and on ridgetops in the Ridge and Valley province near the Hartsells, Cookport, and Nolo soils. It is somewhat finer textured than the soil described for the series, and it grades toward the Hartsells series. Many sandstone fragments from ½ to 4 inches in diameter and a few large sandstone fragments are on the surface and scattered throughout the profile.

The texture of the surface layer is silt loam, sandy loam, or loam, and that of the subsoil is sandy loam to sandy clay loam. A few faint mottles of pale brown and strong brown are just above bedrock.

The moisture available for plants is moderate to low. This soil is easy to till, but its ability to hold plant nutrients is poor.

Included with this soil in mapping are small areas of Lehew soils that are cultivated.

Most areas of Dekalb channery loam, 0 to 3 percent slopes, are wooded; however, small areas are used for crops. Yields of all cultivated crops are low, and alfalfa grows poorly. Contour strips and diversion terraces are needed for control of erosion. Much lime is needed to correct acidity. Capability unit IIs–4; woodland suitability group 5.

Dekalb channery loam, 3 to 8 percent slopes (DaB).—This gently sloping to moderately sloping soil is near the Cookport and Hartsells soils on mountaintops in the Allegheny Plateau section and on ridgetops in the Ridge and Valley province. Numerous fragments of sandstone occur throughout the solum. This soil is from 18 to 30 inches deep, but it is deeper in many small areas. In places the surface layer is silt loam, and the subsoil is sandy clay loam

that contains a few, fine, faint mottles. This soil holds little moisture for plants and is very acid.

Included with this soil in mapping are small areas of Nolo soils that are in low spots in areas of this soil.

Most of this Dekalb soil is woodland covered mainly with white oak and red oak, but also with some chestnut oak, aspen, Virginia pine, pitch pine, ironwood, and sassafras. Mountain-laurel, rhododendron, ironwood, and sassafras are common in the understory. Teaberry, partridgeberry, and blueberry are also common. Cleared areas of this soil are mainly in pasture. If enough moisture and fertilizer are available for plants, yields of potatoes are fair. Yields of other crops are limited by the short growing season and the lack of moisture during droughts. Diversion terraces and stripcropping are needed for control of excess water and to reduce erosion. Capability unit IIe–6; woodland suitability group 5.

Dekalb channery loam, 3 to 8 percent slopes, moderately eroded (DaB2).—This gently sloping soil is in the Allegheny Plateau section and the Ridge and Valley province. Most areas are under cultivation, or have been cultivated, and from 25 to 75 percent of the surface layer has been lost through erosion. The plow layer is 6 to 8 inches of sandy loam. It overlies a subsoil of yellowish-brown sandy loam or sandy clay loam. In places the texture of the surface layer is silt loam.

This soil ranges from 16 to 22 inches in depth. Many small fragments of sandstone and a few larger stones are in the soil, but these do not seriously hinder cultivation. Stones picked from cropland border many of the fields.

This Dekalb soil is droughty, is strongly acid, and has poor ability to hold moisture for crops during droughts. Ability to hold plant nutrients is also poor. Many fields that were previously in crops have been planted to pines. On idle fields blueberry and sweetfern are the major plants, but soon aspen and gray birch grow, and some Virginia pine, sassafras, and staghorn sumac. Red and white oaks eventually are dominant.

Yields of potatoes are fair if enough moisture can be maintained for plants during droughts in summer, and if enough fertilizer is added. Yields of other crops commonly grown are poor. Diversion terraces and stripcropping are needed for control of excess water and to reduce erosion. Capability unit IIe–6; woodland suitability group 5.

Dekalb channery loam, 8 to 15 percent slopes (DaC).—This moderately sloping soil is in the Allegheny Plateau in the northern part of the county and in the Ridge and Valley province. It contains few or no large stones, but its profile is otherwise similar to the one described for the series. Small sandstone fragments are numerous.

Included with this soil in mapping are small areas of Lehew soils that are cultivated.

The cover of woodland on Dekalb channery loam, 8 to 15 percent slopes, is made up of white oak, red oak, pitch pine, chestnut oak, and mountain-laurel. Yields of potatoes are moderate. Yields of other crops, including alfalfa, are poor because the soil cannot hold enough moisture for plants during droughts in summer. The soil also is very acid and low in plant nutrients. It holds fertilizer poorly for plant growth; consequently, frequent applications are needed. Diversion terraces and stripcropping are needed for control of excess water and to reduce erosion. Large amounts of lime are needed if the soil is cultivated. Capability unit IIIe–5; woodland suitability group 5.

Dekalb channery loam, 8 to 15 percent slopes, moderately eroded (DaC2).—This moderately sloping soil is on tablelands in the Allegheny Plateau section and in the Ridge and Valley province. It is relatively free of large stones, but it is otherwise similar to the soil described for the series. Small channery fragments less than 6 inches in diameter are numerous. On the borders of fields are many stone fragments 6 inches or more in length that were placed there after being picked from the soil. From 25 to 75 percent of the former surface layer has been lost through erosion, and the plow layer is now 5 to 7 inches of sandy loam. This soil is from 14 to 20 inches deep.

This soil does not hold enough moisture for plants during periods when rainfall is low. It is very acid and is low in plant nutrients. As a result yields of potatoes and other crops are low to moderate. On idle fields sweetfern, broomsedge, blueberry, and povertygrass are the major plants. Soon, however, aspen, gray birch, and staghorn sumac become established and are followed by red oak, white oak, chestnut oak, and pitch pine. Red and white oaks eventually are dominant.

If this soil is used for crops, diversion terraces and stripcropping are needed for control of excess water and to reduce erosion. Capability unit IIIe–5; woodland suitability group 5.

Dekalb channery loam, 15 to 25 percent slopes (DaD).—This moderately steep soil is in the Allegheny Plateau section and the Ridge and Valley province near the Dekalb very stony soils. The surface layer is 5 to 7 inches thick, and it contains many fragments of channery sandstone. The subsoil also contains many fragments of sandstone. Depth to bedrock ranges from 14 to 20 inches.

This soil is moderately low in moisture-holding capacity for plants, and permeability to water is moderate. Short droughts seriously affect plant growth.

Included with the soil in mapping are small areas of Lehew soils that are cultivated.

On idle fields of this Dekalb soil, the cover is mostly sweetfern, broomsedge, blueberry, and povertygrass. This soil is suited to permanent hay, pasture, or trees, but row crops can be grown occasionally. Capability unit IVe–5; woodland suitability group 5.

Dekalb very stony soils, 0 to 8 percent slopes (DkB).—These nearly level to gently sloping soils are on tablelands in the mountainous part of the county. Many sandstone fragments 15 inches in length or longer are on as much as 15 percent of the surface. Depth to bedrock ranges from 2 to 3½ feet. The surface layer and subsoil are variable in texture.

Included with these soils in mapping are small areas of Dekalb very stony sandy loam and Cookport and Hartsells soils.

Dekalb very stony soils, 0 to 8 percent slopes, are droughty in midsummer because they cannot hold large amounts of moisture for crops. Because of the stones, these soils are difficult or impossible to cultivate. They are limited to use for pasture or trees, since they are not suited to row crops. Capability unit VIs–3; woodland suitability group 5.

Dekalb very stony soils, 8 to 25 percent slopes (DkC).—These moderately sloping to steep soils are on tablelands of the Allegheny Plateau section and the Ridge and Valley

province. The profile of these very stony soils is like that described for the series. Sandstone fragments 15 inches long or longer are on as much as 15 percent of the surface.

Small areas of Cookport soils are included with these soils in mapping.

Dekalb very stony soils, 8 to 25 percent slopes, are droughty and are low in fertility. Chestnut oak, white oak, red oak, pitch pine, mountain-laurel, and rhododendron are the main trees and shrubs. Capability unit VIs–3; woodland suitability group 5.

Dekalb very stony soils, 25 to 100 percent slopes (DkE).—These very steep soils are on the sides of mountains in the Allegheny Plateau and on ridges of the Ridge and Valley province. The acreage is large. Large boulders and fragments of sandstone occupy as much as 15 percent of the profile. These soils are from 1 to 2 feet deep, and sandstone outcrops are numerous in places. They are deepest near the base of steep slopes. Shallower areas are at the top or brow of the slopes.

These soils are very acid and are low in fertility. They cannot hold moisture for plants during droughts; consequently, they are dry in summer when plants need moisture.

Included with these soils in mapping are small areas of Dekalb very stony loam and of Stony land.

These Dekalb very stony soils are all forested, but they are only moderately well suited or poorly suited to trees. Chestnut oak, red oak, white oak, pitch pine, white pine, mountain-laurel, and rhododendron are the main trees. Capability unit VIIs–1; woodland suitability group 8.

Gilpin Series

The Gilpin series consists of moderately deep, well-drained, brownish, nearly level to moderately steep, silty soils. These soils formed in material from acid gray shale and siltstone. They are in upland areas in the central and northern parts of the county.

The surface layer is dark grayish-brown, friable silt loam 1 to 2 inches thick. Beneath this is 3 to 6 inches of brown, friable silt loam. This layer contains from 5 to 10 percent of shale chips and numerous roots. It is strongly acid. The subsoil is yellowish-brown, friable very shaly silty clay loam that is 10 to 15 inches thick and is strongly acid. The substratum is a mixture of dark yellowish-brown fine soil particles and shale chips.

The texture of the surface layer is silt loam. The number of shale chips and small sandstone fragments increases with increasing depth. Depth over bedrock ranges from 20 to 36 inches. These soils are finer textured and have fewer large coarse fragments than the Dekalb soils.

Gilpin soils have moderately low moisture-holding capacity for plants. They are easy to till, and the sloping soils erode easily. The soils are moderately acid to strongly acid, but applying lime easily corrects acidity. Crops on these soils respond well if fertilizer is added.

These soils produce moderate yields of farm crops commonly grown in the county. A few areas are used for crops, but most areas are in woodland made up of red oak, white oak, wild cherry, beech, white pine, pitch pine, red maple, dogwood, and juneberry. Sweetfern, broomsedge, dewberry, and huckleberry grow on idle fields.

Gilpin silt loam, 0 to 3 percent slopes (GpA).—This nearly level soil is in the Allegheny Plateau in the western, central, and northern parts of the county. The surface layer and subsoil are deeper, and depth to hard rock is greater, but this soil is otherwise similar to the soil described for the series.

Permeability to water and plant roots is good, and the moisture-holding capacity is moderately high. The soil is easy to work. Runoff is slight.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well. A crop rotation of moderate intensity is generally needed. Capability unit IIs–1; woodland suitability group 5.

Gilpin silt loam, 3 to 8 percent slopes (GpB).—This gently sloping soil is in the Allegheny Plateau in the western, central, and northern parts of the county. Its profile is the one described for the series.

Permeability to water and plant roots is good, and the moisture-holding capacity for plants is moderate. Runoff is also moderate. The soil is easy to work.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well. A crop rotation of moderate intensity is generally suitable. Diversion terraces and contour strips are needed for control of runoff and to reduce erosion. Capability unit IIe–5; woodland suitability group 5.

Gilpin silt loam, 8 to 15 percent slopes (GpC).—This moderately sloping soil is in the Allegheny Plateau in the western, central, and northern parts of the county. It is more shallow and contains more coarse fragments than the profile described for the series.

Permeability to water and plant roots is good, but the moisture-holding capacity for plants is moderately low. Runoff is moderately rapid. As a result, the soil erodes readily. The soil is easy to work.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well if lime and fertilizer are applied. A crop rotation of low intensity can be used. Diversion terraces and contour strips are needed for control of excess runoff and to reduce erosion. Capability unit IIIe–4; woodland suitability group 5.

Guthrie Series

The Guthrie series consists of poorly drained, grayish-brown, gently sloping to moderately sloping soils, which have a firm silty clay subsoil that contains much lime. These soils are in upland areas near seeps in the limestone valleys, and a fairly large area is in the eastern end of Nittany Valley.

The plow layer is 7 to 9 inches of very dark grayish-brown, friable silt loam that is nearly neutral. It contains numerous roots. The upper part of the subsoil is brownish, slightly firm silty clay loam or silty clay 10 to 18 inches thick. This layer is sticky and plastic when wet and is slightly acid to neutral. The lower part of the subsoil is 12 to 21 inches of olive-brown or brown, firm silty clay that is mottled with gray. It is sticky and plastic when wet and is medium acid to neutral. The substratum is brown, firm silty clay to a depth of 48 inches or more and is sticky and plastic when wet. The underlying material is hard, gray, massive limestone.

The texture of the surface layer ranges from silt loam to silty clay loam. Depth of the soil ranges from 36 to 72 inches. Depth to mottling ranges from 8 to 15 inches. These soils range from medium acid to slightly alkaline.

Guthrie soils are near the deep, well-drained Hagerstown and Murrill soils. They are finer textured than the Andover soils, have fewer coarse fragments, and are much less acid.

Permeability to water and plant roots is moderate to a depth of 10 inches but is slow below that depth. The moisture-holding capacity for plants during droughts is moderately low. Crops on the Guthrie soils respond moderately well if fertilizer is added.

Some areas of these soils are used for crops, and some are left idle. If drained, the Guthrie soils are productive for general farm crops. They have a high content of organic matter, and little lime is needed. On idle land the vegetation is elderberries, sedgegrass, orchardgrass, and whiteclover.

Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded (GuB2).—This is the only Guthrie soil mapped in the county. It is gently sloping and is in upland areas in the limestone valleys. Its profile is the one described for the series.

Permeability to water and plant roots is moderate to a depth of 6 to 8 inches but is slow below that depth. The moisture-holding capacity for plants is moderately low to low during droughts. Crops on this soil respond moderately well if fertilizer is applied.

Unless this soil is drained, it is poorly suited to alfalfa, but it is moderately well suited if drained. Tile can be used to provide drainage. A crop rotation of low intensity is required. Diversion terraces are needed for removing excess water and to reduce erosion. Capability unit IVw–2; woodland suitability group 10.

Hagerstown Series

The Hagerstown series consists of deep, well-drained, nearly level to steep silt loams or silty clay loams that have a yellowish-red clayey subsoil. These soils are in upland areas of the limestone valleys in the southern part of the county. They formed in material derived from limestone and shaly limestone.

The plow layer is dark grayish-brown, granular silt loam 5 to 9 inches thick. This layer is slightly sticky when wet and contains numerous roots and wormholes. The subsoil is 10 to 18 inches of yellowish-red, blocky silty clay loam. It is firm when moist and hard when dry. The upper part contains numerous roots that decrease in number with increasing depth. The underlying material is hard gray limestone.

Depth to limestone ranges from 3 to 6 feet or more. Rock outcrops and ledges range from a few to many. The color of the subsoil ranges from yellowish brown to red, and the reaction, from medium acid to neutral. The acidity in the upper layers depends on the amount of lime that has been applied.

Hagerstown soils are near the moderately well drained Wiltshire and poorly drained Guthrie soils. They are also near the Murrill soils, which are on the lower slopes at the base of mountains. Hagerstown soils are finer textured and redder than the Murrill soils. Also, they are finer textured than the Allenwood soils and are less acid.

Hagerstown soils hold sufficient moisture for crops. They hold fertilizer exceptionally well and release plant nutrients for crops slowly. Little fertilizer is lost through leaching. The subsoil is very sticky and very plastic when wet, but during droughts in summer it becomes very firm. These soils become cloddy if worked when too wet.

These soils are important to the agriculture of the county. If not severely eroded, they produce high yields of all crops commonly grown in the area. Alfalfa and other deep-rooted crops grow well. Even though these soils formed in material derived from limestone, they need moderate amounts of lime.

Hagerstown rocky silt loam, 5 to 15 percent slopes (HaC).—This moderately sloping soil is in upland areas of the limestone valleys and in narrow areas parallel to streams or other drainageways. Large limestone fragments and ledgy outcrops are common. This soil ranges in depth from shallow near the edge of the ledges to deep in areas between the ledges. Erosion is slight in most areas, but in some areas most of the surface layer has been lost through erosion. In color, texture, and consistency the subsoil is similar to that of the Hagerstown soil described for the series. The moisture-holding capacity of this soil is high to moderate.

Alfalfa and other deep-rooted crops grow well on this soil. Because of ledgy outcrops and fragments of limestone, frequent plowing is not advisable. A crop rotation that includes 3 years of hay is needed. Reseeding should be done in contour strips. Capability unit IVes–1; woodland suitability group 2.

Hagerstown rocky silt loam, 15 to 25 percent slopes (HaD).—This moderately steep to steep soil is in upland areas of the limestone valleys, mostly in narrow bands parallel to streams. The soil has many ledgy outcrops and is 12 to 18 inches shallower, but it is otherwise similar to the one described for the series. Depth of the soil ranges from very shallow near the edges of the outcrops to deep between them. The moisture available to plants is moderate to low.

Because of the many outcrops of limestone, farming with machinery is not feasible. Furthermore, machinery cannot be used to make improvements on the soil. This soil is therefore best suited to pasture. Capability unit VIes–1; woodland suitability group 2.

Hagerstown rocky silty clay loam, 25 to 70 percent slopes (HcE).—This steep to very steep soil is in upland areas of the limestone valleys, generally in long narrow bands parallel to streams. It is very shallow to shallow over limestone. Its depth ranges from 8 to 16 inches. Permeability of this soil is moderate, and the moisture-holding capacity for plants is low.

The many chips and outcrops of limestone make this soil best suited to trees. Suitable kinds of trees are given in the section "Woodland Uses of the Soils." Capability unit VIIes–1; woodland suitability group 2.

Hagerstown silt loam, 0 to 3 percent slopes (HeA).—This nearly level soil is on top of the limestone ridge in the center of Nittany and Sugar Valleys. Its profile is somewhat deeper than that described for the series, and the surface layer is browner and more silty.

The moisture-holding capacity for plants is very good. Infiltration of water and internal drainage are moderate; consequently, runoff is moderate to slow. Fertility is high, and crops on this soil respond moderately well if fertilizer is added. If this soil is cultivated when too wet, it becomes compact and cloddy.

This soil is well suited to all crops commonly grown in the county. Alfalfa and other deep-rooted crops grow

well. The soil is suited to continuous row crops, but cover crops and crop residues are also needed for maintaining tilth of the soil. Capability unit I–1; woodland suitability group 2.

Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded (HeA2).—This nearly level soil is on the ridge of the limestone valley in Nittany and Sugar Valleys. Its subsoil and substratum are the same as those of the profile described for the series. The reddish subsoil is exposed on small knolls.

Permeability to water and plant roots is moderate. The moisture-holding capacity for plants is moderate, and fertility is high. The surface layer is hard when dry but is very sticky and plastic when wet; consequently, if the soil is cultivated when too moist, it becomes cloddy.

This soil is well suited to alfalfa and other deep-rooted crops. A crop rotation is needed that includes more hay crops than other crops. Crop residues should be returned to the soil to help maintain the content of organic matter. Capability unit IIe–1; woodland suitability group 2.

Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded (HeB2).—This gently sloping soil is in the limestone valleys. Its profile is the one described for the series. In most areas much of the original surface layer has been removed by erosion, but in some areas this layer is only slightly eroded. In areas where plowing has mixed the surface layer and subsoil, the present surface layer is finer textured than the original one. Runoff is medium, and erosion is a hazard. If this soil is cultivated when too moist, it is likely to compact and become cloddy. During extended droughts, the subsoil becomes hard and has many cracks that extend from the surface to a depth of several feet. Also, during droughts the surface layer tends to crust, and rainwater from hard thunderstorms runs off rather than penetrates the soil. This resistance to wetting can be improved by plowing under the surface layer or mixing more organic matter into it to reduce crusting.

This soil is important to the agriculture of the county, and large areas are cultivated in Nittany and Sugar Valleys. It is a fertile soil; consequently, yields of all crops commonly grown in the county are good. Alfalfa and other deep-rooted crops grow well. Contour stripcropping and diversion terraces that have proper outlets are needed. Capability unit IIe–1; woodland suitability group 2.

Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded (HeC2).—This soil has lost from one-fourth to three-fourths of the surface layer through erosion. In cultivated areas reddish-brown clayey subsoil is exposed on small knolls; between the knolls the soil has a darker surface layer. The soil on the knolls is less deep than the soil between the knolls. It also contains less organic matter, has less moisture-holding capacity, and has lower fertility. Yields, therefore, are also lower. On a few of the knolls there is an outcropping of limestone. Small limestone chips and a few chert fragments are on the surface of this soil.

The subsoil of this soil is hard when dry and very sticky and plastic when wet. It becomes very cloddy if plowed when too wet, and plowing is not feasible if the soil is too dry. This soil is somewhat resistant to wetting after droughts, and subsequent runoff is moderately rapid to rapid. Wide cracks appear in the surface during droughts.

Included with this soil in mapping are some areas of Hagerstown clay loam. Also included are small areas of gently sloping Hagerstown silt loam.

Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded, is well suited to alfalfa and other deep-rooted crops. A crop rotation of medium intensity is needed. Because the major hazard is erosion, diversion terraces and contour stripcropping are needed for reducing runoff. Capability unit IIIe–1; woodland suitability group 2.

Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded (HeD2).—This moderately steep soil is in upland areas of the limestone valleys. Most of the surface layer has been removed through erosion, and the reddish-brown subsoil is exposed in many places. Many small fragments of chert and chips of limestone are on the surface. In a few areas limestone bedrock is only a few inches from the surface. This soil is not so deep as the one described for the series; it ranges from about 16 to 36 inches in depth.

Because the content of organic matter in the surface layer is low, this soil dries out rapidly in summer. The subsoil is hard when dry and sticky and plastic when wet; consequently, it becomes very cloddy if cultivated when too wet and cannot be cultivated at all if it is too dry.

Included with this soil in mapping are small areas of severely eroded Hagerstown silty clay loam.

Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded, is well suited to alfalfa and other deep-rooted crops. A crop rotation that includes 3 or more years of hay is needed. Diversion terraces and contour stripcropping are needed for the control of runoff and to reduce erosion. Capability unit IVe–1; woodland suitability group 2.

Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded (HgB2).—This gently sloping soil is in upland areas of the limestone valleys. Its profile is similar to the one described for the series, but the surface layer and subsoil are finer textured. Also, it has a more blocky structure and a more plastic and darker red subsoil. Limestone chips are common in some places.

Both the surface layer and subsoil are very sticky and plastic when wet; consequently, the soil becomes cloddy if plowed when too wet and cannot be cultivated at all if too dry. Even if the moisture content is satisfactory, plowing is difficult. This soil has low to moderate ability to hold moisture for plants. As a result, summer droughts of only moderate duration seriously affect crop yields.

A crop rotation that includes at least 2 years of hay is needed. Contour stripcropping is needed to reduce erosion, retain moisture, and maintain yields. Diversion terraces can be used for control of excess runoff. Capability unit IIIe–6; woodland suitability group 2.

Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded (HgC2).—This moderately sloping soil is in upland areas in the limestone valleys. Reddish subsoil is exposed on top of knolls, and between the knolls the soil is darker in color. The surface layer is sticky and plastic when wet. The subsoil is very sticky and very plastic when wet and is hard when dry. In many places numerous limestone fragments are on the surface. There are outcrops of bedrock in a few areas.

This soil is difficult to plow, even if the moisture content is right for plowing. Its ability to retain moisture for plants is small. Consequently, crops on this soil are sub-

ject to droughts in summer, are stunted in growth, and have light-green or brown foliage. Wide cracks also appear in the surface of this soil during droughts. The content of organic matter is low. Runoff is rapid. During rainstorms a large amount of water runs off because the soil is resistant to wetting after it has dried out.

Included with this soil in mapping are small areas of Hagerstown silty clay that are severely eroded or that are slightly eroded.

Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded, is well suited to deep-rooted legumes. A crop rotation that includes 3 or more years of hay is needed. Reseeding in contour strips slows runoff. Where they can be installed, diversion terraces help to control runoff and reduce erosion. Capability unit IIIe–6; woodland suitability group 2.

Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded (HgC3).—This moderately sloping soil is in the uplands in the limestone valleys. Its profile is 6 to 12 inches more shallow than that described as representative for the series. The reddish plow layer consists of material from the subsoil, which was exposed by erosion. Some limestone chips are on the surface, and limestone rock outcrops in a few places.

This soil is very sticky and plastic when wet and is hard when dry. Permeability to water is moderate, and plant roots can penetrate to bedrock. The moisture available for plants during droughts is moderately low, but the fertility of the soil is high. Runoff is rapid, and erosion is the major hazard.

Because of severe erosion, this soil is better suited to permanent hay than to row crops. Alfafa and other deep-rooted legumes grow well. Reseeding should be done in contour strips. Capability unit IVe–6; woodland suitability group 4.

Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded (HgD3).—This moderately steep soil is in upland areas of the limestone valleys. It generally is reddish brown. Its profile is 12 to 16 inches more shallow than that described for the series. There are a few outcrops of limestone rock, but these do not seriously interfere with farming.

This soil is hard when dry and very sticky and plastic when wet; consequently, plowing is difficult. Permeability to water is moderate, and plant roots can penetrate to bedrock. The moisture-holding capacity for plants during droughts is moderately low. Runoff is rapid, and erosion is the major hazard.

This soil is better suited to permanent hay than to row crops, and deep-rooted legumes grow well. Reseeding should be done in contour strips. Capability unit VIe–3; woodland suitability group 4.

Hartleton Series

In the Hartleton series are deep, well-drained, brownish, nearly level to moderately sloping soils that have a moderately fine textured, channery subsoil. These soils are in the shale hills between Beech Creek and Pine Creek. They formed in material from acid gray and brown shale.

The surface layer is brownish, granular channery silt loam 5 to 9 inches thick. This layer contains many shale fragments and is moderately acid to strongly acid. The upper part of the subsoil is 13 to 18 inches of brown, friable channery silt loam that contains 20 to 40 percent of shale fragments. It is medium acid to strongly acid. The lower part of the subsoil is dark-brown or reddish-brown, friable channery loam or silt loam 11 to 20 inches thick. This layer contains 25 to 50 percent of coarse shale fragments and is strongly acid. The substratum is a very friable and permeable mixture of shale and fine material. The rock underlying this layer is laminated, tilted, gray and brown shale and sandstone.

These soils range from 2 to 4 feet in depth. Depth to hard rock ranges from 3 to 8 feet. The content of coarse fragments ranges from 10 to 50 percent of the volume.

The Hartleton soils are near the moderately deep to shallow, well-drained Berks soils, the moderately well drained Comly soils, and the poorly drained Brinkerton. They are deeper than the Gilpin soils and contain more coarse fragments.

These soils are moderately permeable to water and plant roots and hold moderate amounts of moisture for plants. They erode readily. Crops on these soils respond well to fertilizer.

Most crops suitable to the area can be grown on these soils. Because the soils are easy to work, most areas are used for crops. Alfalfa grows moderately well. Small areas are in woodland made up of white and red oaks, Virginia pine, and red maple.

Hartleton channery silt loam, 0 to 3 percent slopes (HhA).—This nearly level soil is on ridgetops and benches in the shale hills. It has a plow layer 7 to 10 inches thick, which in places contains shale fragments. This soil is deeper than the one described for the series and contains fewer shale fragments throughout.

Permeability of this soil to water and plant roots is good. The moisture-holding capacity for plants during droughts is moderate to moderately high. This soil is easy to work, and crops on it respond well if fertilizer is added. Runoff is slow.

Included with this soil in mapping are small areas of Hartleton shaly silt loam and some areas of a soil that is moderately eroded.

This Hartleton channery silt loam is somewhat more productive than the other soils in the Hartleton series. A crop rotation of high intensity is suitable. Capability unit IIs–1; woodland suitability group 5.

Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded (HhB2).—This gently sloping soil is on the shale hills. Plowing has mixed material from the subsoil with the remaining surface soil, and the present surface layer is 4 to 6 inches thick. Many shale chips are on the surface and in the soil.

Permeability of the soil to water and plant roots is good. The moisture-holding capacity for plants is moderate. This soil is easy to work, and crops on it respond well if fertilizer is added. Runoff is medium.

Included with this soil in mapping are small areas of Hartleton shaly silt loam that are only slightly eroded, or are not eroded, and small areas that are severely eroded.

A crop rotation of moderate intensity is suitable for this Hartleton channery silt loam. Diversion terraces and contour stripcropping are needed for the control of runoff. Capability unit IIe–5; woodland suitability group 5.

Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded (HhC2).—This moderately sloping soil

is on the shale hills. Its profile is the one described for the series.

This soil is moderately permeable to water and plant roots and holds moderate amounts of moisture for plants. Runoff is rapid. Crops on this soil respond well if fertilizer is added.

Included with this soil in mapping are small areas of Hartleton shaly silt loam. Also included are some areas that are slightly eroded and severely eroded.

Most crops suitable to the area can be grown on this Hartleton channery silt loam. A crop rotation of low intensity is needed. Diversion terraces and contour stripcropping are needed also for control of runoff. Capability unit IIIe–4; woodland suitability group 5.

Hartsells Series

In the Hartsells series are deep, well-drained, nearly level to moderately sloping, brownish soils. These soils have a medium-textured subsoil that contains many coarse fragments. They are in upland areas throughout the county. These soils formed in material derived mainly from acid gray sandstone but partly from red sandstone.

In wooded areas the surface layer is 1 to 3 inches of very dark gray channery loam. It is underlain by a 1-inch layer of light-gray channery loam. Yellowish-brown sandy loam 4 to 6 inches thick completes the surface layer. This layer is medium acid to slightly acid. Coarse fragments range from 5 to 15 percent of the volume. The upper part of the subsoil is yellowish-brown sandy loam that is 8 to 12 inches thick and contains 10 to 15 percent of small sandstone fragments. This layer is very strongly acid. The lower part of the subsoil is 16 to 24 inches of strong-brown channery sandy loam that grades to very channery sandy loam. It is very strongly acid. Coarse fragments are more numerous with increasing depth.

Depth to hard rock ranges from 3 to 5 feet. A few areas are stony. The texture of the subsoil is sandy clay loam, sandy clay, sandy loam, or loam. The color of the subsoil is mainly yellowish brown, but in places it is strong brown or reddish brown.

Hartsells soils are near the moderately deep, well-drained Dekalb soils and the moderately well drained to somewhat poorly drained Cookport soils. They are also near the poorly drained to somewhat poorly drained Nolo soils and the very poorly drained Lickdale soils. Hartsells soils are deeper than the Dekalb soils and have a finer textured subsoil.

Hartsells soils have moderate to high water-holding capacity for plants. They are moderately permeable to water and plant roots. These soils are easy to work, and crops on them respond well if fertilizer is added.

Most areas of these soils are wooded, but small areas are used for crops and pasture. Most crops suitable to the area can be grown. The plant cover on these soils consists mainly of red oak, white oak, red maple, and sugar maple but includes some chestnut oak and white pine. Mountain-laurel, blueberry, juneberry, and teaberry make up the undergrowth. On idle fields timothy, povertygrass, wild carrot, goldenrod, cinquefoil, dewberry, and blackberry are the main plants. In many areas white pine is becoming reestablished.

Hartsells channery loam, 0 to 3 percent slopes (HrA).—This nearly level soil is in mountainous areas. The surface layer is thicker than that of the profile described for the series, and in many places the subsoil is finer textured. Also, depth to bedrock is greater; it ranges from 4 to 5 feet.

Permeability of this soil to water and plant roots is moderate, and the moisture-holding capacity for plants is high. Runoff is slight. This soil is easy to work. Crops on it respond well if fertilizer is applied.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well if sufficient lime is applied. A crop rotation of high intensity is suitable. Contour cultivation is needed for the control of runoff. Capability unit I–2; woodland suitability group 1.

Hartsells channery loam, 0 to 3 percent slopes, moderately eroded (HrA2).—This nearly level soil is in convex areas on mountains. Plowing has mixed material from the subsoil with the remaining surface soil in many areas. The present surface layer is 4 to 6 inches thick and has a moderately low content of organic matter.

Permeability to water and plant roots is moderate. The moisture-holding capacity for plants is moderately high to high. Runoff is medium. This soil is easy to work, and crops on it respond well if fertilizer is applied.

Most areas are used for crops, and this soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well if sufficient lime is applied. A crop rotation of high intensity can be used. Contour cultivation is needed for the control of runoff. Capability unit IIe–2; woodland suitability group 1.

Hartsells channery loam, 3 to 8 percent slopes (HrB).—This gently sloping soil is in mountainous areas. Its profile is the one described for the series.

The moisture-holding capacity for plants is good. Runoff is medium during heavy rains. The soil is easy to work, and crops on it respond well if fertilizer is applied.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well if sufficient lime is applied. A crop rotation of moderate intensity can be used. Diversion terraces and stripcropping are needed for the control of runoff. Capability unit IIe–2; woodland suitability group 1.

Hartsells channery loam, 3 to 8 percent slopes, moderately eroded (HrB2).—This gently sloping soil is in convex areas on mountains. It is less deep than the soil described for the series and contains a few large stone fragments. Erosion has removed part of the surface soil, and material from the subsoil has been mixed with the remaining surface soil by plowing.

The moisture-holding capacity for plants is good. This soil is easy to work, and crops on it respond well if fertilizer is applied. During heavy rains runoff is medium.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well if sufficient lime is applied. A crop rotation of moderate intensity can be used. Diversion terraces and stripcropping are needed for control of runoff. Capability until IIe–2; woodland suitability group 1.

Hartsells channery loam, 8 to 15 percent slopes, moderately eroded (HrC2).—This moderately sloping soil is in mountainous areas. The surface layer is 4 to 6 inches thick and is low in organic matter. It contains a moderate amount of fragments of channery sandstone and a few large sandstone boulders. Depth to bedrock ranges from 3 to 4 feet.

The moisture-holding capacity for plants is moderately good. This soil is easy to work, and crops on it respond well if fertilizer is added. Runoff is medium during heavy rainfall.

Most crops commonly grown in the county are suited to this soil. Alfalfa grows moderately well if sufficient lime is applied. A crop rotation of moderately low intensity can be used. Contour stripcropping and diversion terraces are needed for control of runoff. Capability unit IIIe–2; woodland suitability group 1.

Hartsells very stony loam, 0 to 8 percent slopes (HsB).—This nearly level to gently sloping soil is in mountainous areas. It contains some large sandstone boulders, but it is otherwise similar to the soil described for the series.

Permeability to water and plant roots is moderate. The moisture-holding capacity for plants is moderately high. During heavy rains runoff is medium to slow.

This soil is generally used for pasture and trees. Unless the large sandstone fragments are removed, it cannot be worked with farm equipment. If lime and fertilizer are applied, growth of desirable pasture plants is encouraged. Capability unit VIs–2; woodland suitability group 1.

Huntington Series

In the Huntington series are deep, well-drained, brownish soils that are nearly level and slightly undulating and have a surface layer of silt loam or fine sandy loam. Some of these soils formed in alluvium along the bottoms of streams that drain areas of soils underlain mostly by limestone. Others formed in local alluvium along small streams, coves, broad depressions, and sinkholes in the limestone valleys.

The plow layer is 7 to 9 inches of dark-brown, friable silt loam that is slightly acid and contains many roots. Below this layer is 24 to 36 inches of dark-brown, friable light silty clay loam or silt loam that contains a few pebbles and is medium acid to slightly acid.

The texture of the surface layer is mainly silt loam and fine sandy loam, but that of the subsoil ranges from sandy loam to silty clay loam. The number of pebbles varies. Pieces of wood, charcoal, and other debris are in a few areas. Mottles are at a depth below 36 inches in places.

The Huntington soils are near the moderately well drained to somewhat poorly drained Lindside soils, the somewhat poorly drained Newark, and the poorly drained Melvin soils. They are finer textured and darker brown than the Pope soils and are less acid.

Permeability of these soils to water and plant roots is good. The moisture-holding capacity for plants is high. These soils are moderately acid to neutral. They are easy to work and are very fertile. Crops on these soils respond well if fertilizer is added.

Huntington soils are suited to all crops commonly grown in the county. They are subject to periodic flooding, but the damage to soils and crops is usually slight. The water table is generally 4 to 8 feet from the surface.

Huntington fine sandy loam (Hf).—This nearly level soil is on alluvial terraces along streams that drain Nittany, Sugar, and Bald Eagle Valleys adjacent to areas of Huntington silt loam. The surface layer is fine sandy loam, and the subsoil is sandy loam or loamy sand.

Permeability to water is rapid, and the moisture-holding capacity for plants is moderate. This soil is slightly acid to neutral. It is easy to work, but its ability to hold fertilizer is poor because of its coarse texture.

This soil is suited to all crops commonly grown in the county. Alfalfa grows well. A crop rotation of high intensity can be used. Capability unit I–3; woodland suitability group 2.

Huntington silt loam (Hu).—This nearly level soil is on flood plains of streams, mainly in Nittany and Sugar Valleys. Its profile is the one described for the series.

Permeability to water and plant roots is good. The moisture-holding capacity for plants is high. This soil is slightly acid to neutral. It is easy to work, and crops on the soil respond well if fertilizer is added.

This soil is suited to all crops commonly grown in the county, and alfalfa grows well. Yields are high. The soil is flooded periodically, but the damage to the soil and crops is generally slight. A crop rotation of high intensity is suitable. Capability unit I–3; woodland suitability group 2.

Huntington silt loam, local alluvium, 0 to 3 percent slopes (HvA).—This nearly level soil is in coves and on flood plains of small, intermittent streams that drain Nittany and Sugar Valleys. It is dark yellowish-brown, friable silt loam to a depth of 30 inches or more, and the amount of chert in it increases with increasing depth. In some places the soil grades to silty clay loam at a depth of 32 to 48 inches. At a depth of 30 to 60 inches the material is coarse cherty loam, which was derived from fertile silt and clay washed from adjacent limestone slopes.

Permeability to water is moderate to moderately rapid. The moisture-holding capacity for plants is moderate to moderately high. Runoff is slight. This soil is slightly acid to neutral. It is easy to work, and crops on the soil respond well if fertilizer is added.

This soil is highly productive for all crops commonly grown in the county. Alfalfa grows well. The soil receives periodic floods, but damage to crops is usually slight. A crop rotation of high intensity can be used. Capability unit I–1; woodland suitability group 2.

Huntington silt loam, local alluvium, 3 to 8 percent slopes (HvB).—This gently sloping soil is in coves and on narrow flood plains of intermittent streams in Nittany and Sugar Valleys. It is dark yellowish-brown, friable silt loam to a depth of 24 to 30 inches and contains fragments of chert and limestone in places. A finer textured layer of reddish silty clay loam is at a depth of 24 to 48 inches. This soil gradually grades to the surrounding Hagerstown soils.

Permeability to water is moderate, and the moisture-holding capacity for plants is moderate to moderately high. Runoff is medium, but accumulations of water from surrounding areas can be damaging. This soil is slightly acid to neutral. It is easy to work, and crops on it respond well if fertilizer is added.

This soil produces good yields of all crops commonly grown in the county. A crop rotation of moderate intensity is suitable. Diversion terraces and contour stripcropping are needed for control of runoff and to reduce erosion. Capability unit IIe–1; woodland suitability group 2.

Klinesville Series

The Klinesville series consists of shallow to very shallow, well-drained, reddish, moderately steep to very steep soils that have a very shaly subsoil. These soils formed on hills in material weathered from red shale and sandstone.

The surface layer is 3 to 6 inches of dark reddish-brown, friable channery silt loam that is 40 to 50 percent shale and sandstone fragments. The subsoil is reddish-brown very channery loam 8 to 14 inches thick. This layer is about 70 percent coarse fragments of shale and sandstone, and it is medium acid. The substratum is reddish-brown very channery loam, 80 to 90 percent of which is coarse fragments. This part is strongly acid to medium acid. The underlying rock is reddish-brown shale and sandstone.

The content of coarse fragments ranges from 40 to 60 percent in the surface layer and from 60 to 90 percent in the subsoil.

The Klinesville soils are near the moderately deep, well-drained Leck Kill soils. Unlike the Berks and Montevallo soils, Klinesville soils are red and reddish brown rather than yellowish brown.

Permeability of these soils is rapid, and the water-holding capacity for plants is low. The soils are low in fertility; however, crops respond moderately well if fertilizer is added. Runoff is rapid, and the surface layer is likely to erode if rainfall is heavy. The vegetation consists mainly of Virginia pine, chestnut oak, and staghorn sumac, but it includes some white pine. The ground cover under natural conditions is povertygrass, goldenrod, dewberry, blackberry, and cinquefoil.

Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded (KcD3).—This moderately steep soil is on the shale hills between Beech Creek and Pine Creek. Its profile is the one described for the series.

Permeability of the soil to water is rapid, and plant roots penetrate to bedrock. The moisture-holding capacity for plants is low. During heavy rains runoff is rapid. Because this soil retains only a small amount of plant nutrients, crops on it respond only moderately well if fertilizer is added. Droughts in summer cause fruits on trees and other plants to ripen prematurely.

This soil is used mainly for pasture or trees. Capability unit VIIe–1; woodland suitability group 5.

Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded (KcE3).—This steep and very steep soil is in the red shale area between Beech Creek and Pine Creek. The surface layer ranges from 0 to 3 inches in thickness. The channery subsoil is 10 to 20 inches thick and is exposed in a few areas.

Permeability to water and plant roots is good, but moisture-holding capacity for plants is low. This soil is low in fertility, and crops on it respond poorly if fertilizer is added. This soil is better suited to trees than to row crops. Capability unit VIIe–1; woodland suitability group 8.

Laidig Series

In the Laidig series are deep, well-drained, brownish, gently sloping to moderately steep soils that are very stony and gravelly and have a fragipan in the lower part of the subsoil. These soils are on benches and lower slopes at the base of mountains, mainly in the southern part of the county.

The uppermost part of the surface layer is black loam 1 to 3 inches thick. It is underlain by 1 to 2 inches of dark yellowish-brown loam. Below this layer is reddish-yellow loam 4 to 7 inches thick. All three of the layers are 20 to 40 percent coarse fragments of sandstone, and all are extremely acid. The subsoil is 23 to 31 inches of strong-brown, friable very stony loam. From 40 to 60 percent of this layer consists of coarse fragments of sandstone, and it is extremely acid to very strongly acid. The substratum is strong-brown, firm sandy loam or loam 24 to 34 inches thick. It is 40 to 60 percent coarse fragments of sandstone and is very strongly acid. The underlying parent material is strong brown, firm, very slightly weathered, extremely acid fine sandy loam, 45 percent of which consists of coarse fragments. This layer is slowly permeable to water. It extends to a depth of 30 feet in places.

Laidig soils are near the moderately well drained to somewhat poorly drained Buchanan soils, the poorly drained to somewhat poorly drained Andover soils, and the moderately deep, well-drained Dekalb soils. They have more coarse fragments, a lower pH, and a firmer subsoil than the Murrill soils. Furthermore, they are better drained than the Buchanan soils.

The surface layer of the Laidig soils is moderately permeable to water and plant roots, but the lower part of the subsoil is slowly permeable to water. These soils respond moderately well if lime and fertilizer are applied. They are moderately easy to till and are suited to most crops grown in the county. On large areas the woodland is a mixture of red oak, black oak, white oak, white pine, pignut hickory, and red maple, and the understory consists of mountain-laurel, rhododendron, and blueberry. Teaberry and ground pine are also common. On idle fields broomsedge, dewberry, goldenrod, cinquefoil, and blackberry make up the cover.

Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded (LaB2).—This gently sloping soil is mainly in the southern part of the county on the toes of slopes that extend from the base of mountains. The plow layer is gravelly loam, which is 8 to 10 inches thick. Large, coarse fragments of sandstone are lacking in many places, but this soil is otherwise similar to the one described for the series. This soil gradually grades to a moderately well drained Buchanan soil at the lower edge of the mapped area. Fence rows built of stones that originally were in fields are common.

Permeability to water and plant roots is moderate to a depth of 42 to 46 inches, but the soil is slowly permeable below this depth. The moisture-holding capacity for plants is high. This soil is easy to work, and crops on it respond moderately well if fertilizer is added.

Included with this soil in mapping are small areas of less eroded, more nearly level Laidig soils.

This Laidig soil is suited to most crops commonly grown in the county. Growth of alfalfa is moderately good to poor. A crop rotation of moderate intensity is suitable. Diversion terraces and stripcropping are needed to reduce erosion and for control of runoff from higher areas. Capability unit IIe–2; woodland suitability group 1.

Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded (LaC2).—This moderately sloping soil is in concave areas at the base of mountains in the southern part of the county. Erosion has removed part of the surface soil, and material from the upper part of the subsoil has been mixed with the remaining surface soil by plowing. Otherwise, the soil is similar to the one described for the series. The present surface layer is gravelly loam or gravelly silt loam that has a moderately low content of organic matter.

Permeability to water and plant roots is moderate. The moisture-holding capacity for plants is high. Runoff is medium to rapid. The soil is easy to work.

Areas of an uneroded soil are included with this soil in mapping.

This Laidig soil is moderately productive and is suited to most crops commonly grown in the county. A crop rotation of low intensity is suitable. Diversion terraces and stripcropping are needed for control of runoff. Capability unit IIIe–2; woodland suitability group 1.

Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded (LaD2).—This moderately steep soil is near the base of mountains in the southern part of the county. Part of the surface layer has been removed through erosion, and material from the subsoil has been mixed with the remaining surface soil by plowing. The present surface layer is moderately low to low in natural fertility, and its content of organic matter is low. It also is in poor tilth. Much of the rain that falls runs off the surface quickly. The moisture-holding capacity, however, is moderate, and crops on the soil respond well if fertilizer is added.

This soil is better suited to permanent hay, pasture, or trees than to row crops. Row crops can be grown if the areas are protected by diversion terraces and if a rotation of low intensity is used. Reseeding should be done in contour strips. Capability unit IVe–2, woodland suitability group 1.

Laidig very stony loam, 0 to 8 percent slopes (LdB).—This soil is on the lower parts of gradual slopes at the base of mountains in the southern part of the county. Drainage is somewhat restricted nearer the surface, and the soil is about 1 to 2 feet thicker, but its profile is otherwise similar to the one described for the series. Large cobblestones and boulders of sandstone cover as much as 1 to 3 percent of the surface. Permeability to water and plant roots is good, and the moisture available for plants is high.

Because of the boulders and cobblestones, the use of this soil is limited to pasture and trees. Farm machinery cannot be used on the soil. If this soil is used for pasture, lime and fertilizer should be applied to encourage growth of desirable pasture plants. Capability unit VIs–2; woodland suitability group 1.

Laidig very stony loam, 8 to 25 percent slopes (LdC).—This soil is on the upper part of concave slopes at the base of mountains in the southern part of the county. Its profile is the one described for the series. Large stones cover 1 to 3 percent of the surface. The moisture available for plants is high.

Because of the stones, the use of this soil is limited to pasture or trees. If this soil is used for pasture, lime and fertilizer are needed to encourage the growth of desirable pasture plants. Capability unit VIs–2; woodland suitability group 1.

Leadvale Series

In the Leadvale series are deep, moderately well drained, brownish, gently sloping to moderately sloping soils. These soils have a mottled, compact subsoil that contains numerous fragments of sandstone and shale. They are in coves in the west-central part of the county. These soils formed in material washed from soils on higher slopes that formed in material mainly from shale but partly from sandstone.

In wooded areas the upper part of the surface layer is 1 to 3 inches of black, friable silt loam that contains a few fragments of shale and sandstone. Below this layer is dark grayish-brown silt loam 3 to 5 inches thick. Yellowish-brown silt loam makes up the rest of the surface layer. All three of the layers are strongly acid. The upper part of the subsoil is 5 to 7 inches of yellowish-brown silt loam that contains 10 to 20 percent of coarse fragments of shale and sandstone. The middle part of the subsoil is more than 16 inches of brownish silty clay loam or silty clay that is distinctly mottled with gray and brown. This layer is firm and contains numerous, coarse fragments of sandstone and shale. The lower part of the subsoil is very firm silty clay loam or sandy clay loam that contains many fragments of sandstone and shale.

Depth to hard rock ranges from 4 to 10 feet or more. Depth to mottling ranges from 14 to 30 inches, and the content of coarse fragments ranges from 5 to 40 percent. A few large sandstone fragments are scattered over the surface and throughout the soil.

The Leadvale soils are near the moderately deep, well-drained Gilpin and Dekalb soils and the deep, well-drained Hartsells soils. They are finer textured than the Cookport soils and are deeper and less firm in the subsoil.

Permeability of the upper layers to water and plant roots is moderate, but permeability of the lower part of the subsoil is slow. The moisture-holding capacity for plants is high. Crops on these soils respond moderately well to well if fertilizer is applied.

Most farm crops suitable to the county can be grown on these soils. The woodland is made up of red oak, white oak, and white pine. Red maple and juneberry make up the understory. Mountain-laurel, blueberry, and teaberry are the main ground cover.

Leadvale silt loam, 3 to 8 percent slopes (LeB).—This gently sloping soil is in upland coves in the west-central part of the county. Its profile is the one described for the series.

The soil is moderately permeable to water and plant roots to a depth of 16 to 20 inches but is slowly permeable below this depth. The moisture-holding capacity for plants is high. Runoff is negligible in wooded areas, but in cropped areas it is medium. The soil erodes readily. Crops on this soil respond moderately well if fertilizer is added.

This soil is suited to most crops grown in the county, and growth of alfalfa is moderately good to poor. Most areas, however, are in trees. The average elevation is more than 1,500 feet, and the growing season is therefore shorter than that in the southern part of the county. A crop rotation of moderate intensity can be used. Diversion terraces and graded stripcropping are needed for control of excess water. Capability unit IIe–4; woodland suitability group 9.

Leadvale silt loam, 8 to 15 percent slopes (LeC).—This moderately sloping soil is in upland coves in the west-central part of the county. Depth to the fragipan ranges from 18 to 26 inches, but this soil is otherwise like the soil described for the series.

Permeability to water and plant roots is moderate to the fragipan, but below this depth movement of water is slow. The moisture-holding capacity for plants is high. Runoff is negligible in wooded areas, but in cultivated areas it increases. Crops on this soil respond moderately well if fertilizer is added.

Yields of all crops, except deep-rooted ones, are moderate to good. Birdsfoot trefoil grows especially well. The growing season is shorter than that on soils farther south in the county. A crop rotation of low intensity is suitable. Diversion terraces and graded stripcropping are needed for control of runoff. Capability unit IIIe–3; woodland suitability group 9.

Leck Kill Series

The Leck Kill series consists of well-drained, reddish, gently sloping to steep soils that have a medium-textured subsoil. These soils occupy narrow areas in the uplands at the base of the Allegheny escarpment east and west of Swissdale. They formed in material from acid red sandstone, siltstone, and shale.

A typical Leck Kill soil has a plow layer of dark-brown channery silt loam that is 6 to 8 inches thick. This layer contains a few fragments of channery sandstone and shale and is slightly acid to neutral. The upper part of the subsoil is reddish-brown channery silty clay loam 9 to 14 inches thick. It contains about 15 percent fragments of channery red sandstone and shale and is medium to slightly acid. The lower part of the subsoil is also reddish-brown channery silty clay loam and is 5 to 7 inches thick. It is about 30 percent fragments of channery sandstone and shale and is strongly acid. The parent material consists of fragments of sandstone and shale. This material has moderately thick films of silt and clay and is very permeable.

Depth to weathered material ranges from 20 to 32 inches, and the deeper soils are near the bottoms of slopes. The content of shale and sandstone ranges from 5 to 40 percent of the volume.

The Leck Kill soils are near the shallow to very shallow, well-drained Klinesville soils (fig. 8). They are redder than the Hartleton soils but are not so deep as those soils.

These soils have moderate permeability. Roots penetrate easily into the bedrock. The moisture-holding capacity is moderate. Crops on these soils respond well to fertilizer, and most crops suitable to the area can be grown. These soils are moderately acid, but applying moderate amounts of lime will correct the acidity. The plant cover on these soils consists mainly of red oak, black oak, white oak, and white pine but includes some hickory, dogwood, and juneberry.

Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded (LkB2).—This gently sloping soil is on the red shale hills. The plow layer, which is 7 to 9 inches thick, contains small amounts of the subsoil, a reddish-brown silty clay loam. Shale chips are common. In some places the soil is not eroded or is only slightly eroded.

Figure 8.—**Typical landscape of Leck Kill and Klinesville soils.**

Permeability is good, and plant roots can penetrate to bedrock. The moisture-holding capacity is moderate. Runoff is medium, and the soil erodes readily. Crops on this soil respond well if fertilizer is added.

This soil is suited to birdsfoot trefoil and to most other crops grown in the county. Alfalfa also can be grown, and yields are moderate to good. A crop rotation of moderate intensity is suitable. Diversion terraces and stripcropping are needed for control of runoff. Capability unit IIe–5; woodland suitability group 5.

Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded (LkC2).—This moderately sloping soil is on the red shale hills. The surface layer is 4 to 6 inches thick, and in many areas reddish-brown material from the silty clay loam subsoil has been mixed with it. Also, in many places channery fragments occur on the surface. Depth to weathered sandstone and shale ranges from 20 to 30 inches.

Permeability to water is good, and plant roots can easily penetrate the soil. A moderate amount of moisture is held for plant use. This soil is erodible, and runoff is medium. Crops on this soil respond well if fertilizer is applied.

This soil is suited to most crops grown in the county. A cropping system of low intensity is needed. Diversion terraces and contour stripcropping are also needed for the control of runoff and to reduce erosion. Capability unit IIIe–4; woodland suitability group 5.

Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded (LkD2).—This moderately steep soil is on the red shale hills. Its profile is the one described for the series.

Permeability to water is good, and plant roots can penetrate to bedrock. A moderate to moderately small quantity of moisture is held for plant use, and runoff is rapid. Crops on this soil respond moderately well if fertilizer is applied.

This soil is suited to most hay and pasture crops grown in the county. Reseeding of hay and pasture should be done in contour strips. The strips should not be too wide, because excess water rapidly runs off this soil. Capability unit IVe–4; woodland suitability group 5.

Leck Kill channery silt loam, 25 to 35 percent slopes (LkE).—This steep soil is on the red shale hills. The surface layer is 6 to 8 inches thick and is similar to the one described for the series. Where the soil is on the middle part of the steep slopes, the solum ranges from 20 to 24 inches in depth. Where it is near the base of the slopes, however, the solum is as much as 32 inches deep.

Permeability to water is good, and plant roots easily penetrate the soil. Runoff is rapid. Instead of soaking in, much of the rain from heavy showers in summer runs off the soil. This soil is mostly in woodland. It is better suited to pasture and trees than to row crops. Birdsfoot trefoil grows well on this soil. Capability unit VIe–2; woodland suitability group 7.

Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded (LkE2).—This steep soil is on the red shale hills. The surface layer is 3 to 5 inches thick, and part of the silty clay loam from the subsoil and numerous fragments of red channery sandstone have been mixed with it. The depth ranges from 20 to 24 inches.

Permeability to water is good, and plant roots easily penetrate the soil. Runoff is rapid, and much of the rain from heavy summer showers runs off.

This soil is best suited to pasture and trees, but birdsfoot trefoil is also suited and produces good pasture. Reseeding of pasture should be done in contour strips. Capability unit VIe–2; woodland suitability group 7.

Leetonia Series

In the Leetonia series are moderately deep to deep, well-drained, coarse-textured, nearly level to moderately steep soils. These soils have a thick, light-gray surface layer and a sandy subsoil through which water drains rapidly. They are in uplands in the Allegheny Plateau, and the largest area is in the west-central part of the county north of Beech Creek. The soils formed in material derived from gray, coarse-textured sandstone and conglomerate.

The surface layer is 2 to 4 inches of very stony loamy sand mixed with black organic matter made up of decomposed leaves and roots. In many areas this layer is mixed with grains of white sand. Beneath this is 6 to 12 inches of light-gray, loose loamy sand that contains a few small fragments of sandstone and a few roots. This layer is extremely acid to very strongly acid. Large blocks of coarse-grained sandstone and conglomerate make up as much as 15 percent of the surface layer and subsoil. The subsoil is 6 to 12 inches of yellowish-brown, very friable to loose sandy loam that contains 40 to 50 percent of fragments of coarse sandstone. In many places the upper part of the subsoil is darker brown, slightly firm sandy loam. The subsoil is very strongly acid to extremely acid.

The substratum is brownish-yellow, loose very stony loamy sand to sandy loam that contains 60 to 80 percent or more of coarse fragments of sandstone. This layer is very strongly acid to extremely acid. The underlying rock is moderately hard, coarse-grained sandstone and conglomerate that weathers easily and is moderately permeable to water.

Depth to hard rock ranges from 2 to 4 feet. A few small areas are nearly free of stones.

Leetonia soils are near the Dekalb soils. They are coarser textured and more strongly leached than those soils, and they also have a thicker, gray or white surface layer.

Permeability of the soils to water is rapid, and the moisture-holding capacity for plants is low. The soils are strongly acid to extremely acid. They are low in fertility. Crops on these soils respond rapidly if fertilizer is applied, but the response does not last long.

The plant cover on these soils consists mainly of chestnut oak, scrub oak, and a few black oaks but include some sassafras, mountain-laurel, sweetfern, and blueberry. The trees are crooked, stunted, and poorly formed.

Leetonia very stony sandy loam, 0 to 8 percent slopes (LnB).—This nearly level to gently sloping soil is on plateaus in the north-central and northern parts of the county. A large area is a few miles north of Beech Creek. Its profile is the one described for the series.

Permeability is rapid, and the moisture-holding capacity for plants is low. There is little runoff. The soil is naturally low in fertility, and frequent fires have made the soil even less fertile.

This soil is the poorest in the county for crops or trees. It needs to be protected from fires to prevent further loss of fertility. Capability unit VIIs–1; woodland suitability group 6.

Leetonia very stony sandy loam, 8 to 25 percent slopes (LnC).—This moderately sloping to moderately steep soil is on plateaus in the north-central and northern parts of the county. It is 6 to 12 inches more shallow than the soil described for the series. It also contains more coarse blocks of sandstone throughout the profile.

Permeability to moisture is rapid, and the moisture-holding capacity for plants is low. This soil is very low in fertility. Runoff is negligible.

Trees on this soil are stunted, crooked, and poorly formed. Frequent fires have lowered the fertility of this soil, and the areas therefore need to be protected from fire to help improve the stand. Capability unit VIIs–1; woodland suitability group 6.

Lehew Series

The Lehew series consists of moderately deep, well-drained, reddish, gently sloping to very steep soils that have a sandy subsoil. These soils are on slopes of mountains in all parts of the county. They formed in material derived from purplish-red or purplish-gray sandstone.

The surface layer is 1 to 2 inches of black loam over thin, pinkish-gray very stony sandy loam. Below these layers is reddish-brown very stony sandy loam 4 to 7 inches thick. All of these layers contain about 40 percent of coarse fragments and are extremely acid to very strongly acid. The subsoil is 12 to 16 inches of reddish-brown very stony sandy loam that contains 60 to 70 percent of coarse red sandstone fragments and is very strongly acid.

The parent material is reddish-brown extremely stony sandy loam that is 3 to 6 inches thick and contains about 90 percent of coarse fragments. In the southern part of the county, the underlying rock is fine-grained, hard, red sandstone. In the central and northern parts of the county, the underlying rock is layered sandstone that is softer than that in the southern part and is more permeable to water.

The texture of the surface layer is mainly very stony or channery loam, but in small areas it is silt loam and sandy loam. Depth to bedrock ranges from 2 to 3½ feet. In places in the northern part of the county the color of the soils comes from material weathered from thin beds of dark-red shale that are interbedded in the sides of mountains. The Lehew soils in the southern part of the county are coarser textured than those in the northern part.

The Lehew soils are near the deep, well-drained Ungers soils and the moderately well drained Albrights and Dekalb soils. Unlike the Dekalb soils, they have a reddish surface layer and subsoil. They are coarser textured and less deep than the Ungers soils.

The Lehew soils are rapidly permeable to water and have low capacity for holding moisture for plants. They respond rapidly if fertilizer is applied, but the response does not last long.

The plant cover in most areas is chestnut oak and white oak but includes some black oak, white pine, mountain-laurel, and blueberry. In some cultivated areas of the nonstony and slightly finer textured Lehew soils, yields of corn, oats, wheat, and hay are moderate.

Lehew very stony loam, 8 to 25 percent slopes (LvC).—This moderately sloping to moderately steep soil is in mountainous areas. Its profile is the one described for the the series. Large stones are numerous. Permeability is rapid, and the moisture-holding capacity for plants is low. Runoff is slight, and the soil is low in fertility.

Included with this soil in mapping are small areas that contain a few large stones and some gently sloping areas.

Large stones make it impractical to use farm equipment on this Lehew soil. The soil is therefore best suited to pasture or trees. Lime and fertilizer are needed to encourage the growth of native bluegrass. Capability unit VIs–3; woodland suitability group 5.

Lehew very stony loam, 25 to 100 percent slopes (LvE).—This steep to very steep soil is in mountainous areas. It is less deep to hard rock and contains more coarse fragments than the soil described for the series. Permeability is rapid, the moisture-holding capacity for plants is low, and runoff is slight. The soil is also low in fertility.

This soil is best suited to trees. It needs to be protected from fire and grazing. Capability unit VIIs–1; woodland suitability group 8.

Lickdale Series

The Lickdale series consists of very poorly drained, nearly level soils that have a dark-colored surface soil and a firm, clayey subsoil. These soils are in swampy areas and depressions around heads of streams on plateaus in the central and northern parts of the county. The areas are wet and receive fresh deposits of material washed from surrounding soils.

The surface layer is very dark gray to black, friable silt loam 8 to 14 inches thick. This layer is high in organic matter and is strongly acid. Dark-brown mottles extend almost to the surface. The upper part of the subsoil is light brownish-gray to pale-brown, firm clay loam. The lower part is yellowish-brown to brownish-yellow, firm clay loam or silty clay loam. These layers are mottled throughout with light gray and strong brown. They are very strongly acid. The substratum is firm, yellowish-brown silty clay mottled with light gray and yellowish red. This layer extends to a depth of 48 inches or more and is very strongly acid. It is very slowly permeable to water and roots.

Depth of these soils ranges from 24 to 72 inches. The surface layer is commonly silt loam, but in places it is loam or silty clay loam. The texture of the subsoil ranges from clay loam to silty clay, depending on the texture of the parent material in surrounding areas. Slopes are less than 1 percent. In places there are sandstone fragments throughout the soil.

The Lickdale soils are near the deep, well-drained Hartsells soils and the moderately deep, well-drained Dekalb soils. They are also near the moderately well drained to somewhat poorly drained Cookport soils and the poorly drained to somewhat poorly drained Nolo soils. Lickdale soils are less deep than the Dunning soils but are more acid, and generally are less fine textured.

The Lickdale soils have a high water table that remains near the surface most of the year. They are wet because many springs and seeps of large volume keep a constant supply of water flowing into the low areas. These soils are moderate to low in fertility, but the surface layer has a high content of organic matter. Because they are waterlogged, crops on these soils respond very slowly if fertilizer is applied.

Lickdale soils are not suited to farm crops. Because of their low fertility, draining the wet areas is generally not feasible. Large amounts of lime are needed to correct acidity. Cattails, sedges, black alder, and red maple make up the plant cover. Large hemlock stumps are common in many areas.

Lickdale silt loam, 0 to 5 percent slopes (LwA).—This nearly level soil is in depressions on plateaus in the central and northern parts of the county. Its profile is the one described for the series. Permeability to water is very slow, and the soils are too wet for most plants. Crops on this soil respond poorly if fertilizer is added.

Included with this soil in mapping are small areas of a gently sloping soil.

Most of this Lickdale soil is better suited to hay, pasture, or trees than to row crops. It is almost impossible to work the soil with machinery that is commonly available. Drainage ditches are needed to remove excess water, and a bedding system is needed to provide better surface drainage and in places better internal drainage. Large amounts of lime are needed. Capability unit IVw–2; woodland suitability group 11.

Lickdale very stony silt loam (Lx).—This nearly level to gently sloping soil is in depressions on the plateau north of Lock Haven. Large sandstone blocks more than 15 inches in diameter occupy as much as 15 percent of the soil and in places are more numerous, but otherwise this soil is similar to the one described for the series. Because of the large stones, this soil is best suited to trees. Capability unit VIIs–2; woodland suitability group 11.

Lindside Series

In the Lindside series are deep, moderately well drained soils that have a brownish, silty or clayey subsoil. These soils are on flood plains of all streams that drain areas of soil underlain by limestone. They formed in alluvium washed mainly from soils weathered from limestone but also from soils weathered from sandstone and shale.

The surface layer is dark-brown and dark yellowish-brown, friable silt loam 12 to 24 inches thick. It has fine, granular structure, is slightly sticky when wet, and is slightly acid to neutral. The subsoil is 14 to 24 inches of dark grayish-brown silt loam and silty clay loam that has gray and brown mottles. It contains some pebbles and sandy lenses and is slightly acid. The water table generally is in the lower part of this layer. The substratum is dark grayish-brown silt loam and silty clay loam that has gray and brown mottles. It is stratified in some places and has sandy lenses in many places. It contains numerous pebbles and is neutral. The water table is generally above this layer.

The texture of the surface layer is silt loam, loam, fine sandy loam, or sandy loam. Generally, the soils have a brownish hue, but a reddish hue is common in places where material was washed from areas of red sandstone or shale. Depth to mottling ranges from 14 to 24 inches.

The Lindside soils are near the well-drained Huntington and Ashton soils and the somewhat poorly drained Newark and poorly drained Melvin soils.

Permeability of these soils to water and plant roots is high. The soils are easy to work and warm up moderately early in spring. Damage to crops from floods is slight. Most areas of these soils are used for crops. Except for deep-rooted crops, the soils are well suited to all crops grown in the county.

Lindside silt loam (lz).—This is the only Lindside soil mapped in the county. It is nearly level and is on flood plains of streams, which drain areas that contain a large amount of limestone. Its profile is the one described for the series. Permeability is moderate, and the soil holds a large amount of moisture available for plants.

Included with this soil in mapping are small areas of a gently sloping soil and small areas that are severely eroded.

Lindside silt loam is suited to a crop rotation of moderate intensity. Alfalfa grows moderately well. Generally, lime is not needed. Capability unit IIw–3; woodland suitability group 10.

Made Land

Made land (Ma) consists of areas that have been filled with earth, ashes, and trash and then leveled. Most of these areas are in or around urban areas, but some large areas are occupied by factories and railroad yards.

This mapping unit varies greatly in composition and consequently cannot be classified as a soil. Soil properties are extremely variable and range from good to poor. A thorough investigation is needed of each individual site to determine its suitability for the proposed use. Made land was not assigned to a capability unit, because it varies widely in suitability for agriculture. Woodland suitability group 14.

Meckesville Series

The Meckesville series consists of deep, well-drained, reddish, gently sloping to moderately steep soils. These soils are at the base of slopes in the Allegheny Plateau. They formed in material that washed or rolled downhill from upland areas underlain by acid red shale and sandstone.

The plow layer is dark reddish-brown, friable silt loam 6 to 10 inches thick. This layer is generally strongly acid. In many places dark reddish-brown channery silt loam 2 to 6 inches thick directly underlies the surface layer. The upper part of the subsoil is 7 to 15 inches of reddish-brown, friable channery silt loam that is strongly acid.

The lower part of the subsoil is 9 to 21 inches of weak to dusky-red, firm loam or silt loam that contains many channery fragments and is strongly acid to moderately acid.

The texture of the surface layer is dominantly silt loam, but in a few small areas it is channery silt loam and shaly silt loam. In some places mottles and a firm pan are below a depth of 36 inches. There are enough channery fragments in a few small areas to interfere with tillage. Depth of this soil ranges from 4 to 10 feet. In places near the Dekalb and Lehew soils, the Meckesville soils are coarser textured throughout the solum than in the profile described in the foregoing paragraphs.

Meckesville soils are near the Lehew, Ungers, and Dekalb soils. They are deeper than the Ungers soils and contain more coarse fragments. Also, their subsoil is more firm and compacted.

These soils are moderately permeable to water and plant roots. They have a high moisture-holding capacity for plants. The soils are moderately acid to strongly acid in areas where lime has not been applied. Crops on these soils respond well if fertilizer is added.

Most crops commonly grown in the county grow well on these soils. On idle fields the vegetation is made up mainly of broomsedge, cinquefoil, goldenrod, dewberry, and blackberry but includes some white pine, aspen, and crabapple. The woodland is made up of white oak, red oak, cherry, and white pine, and the understory consists of juneberry, dogwood, and red maple.

Meckesville silt loam, 3 to 8 percent slopes, moderately eroded (MeB2).—This gently sloping soil is along the base of hills. The surface layer is 4 to 6 inches thick and contains a few fragments of red shale and sandstone.

Permeability to water and plant roots is moderate, and the moisture-holding capacity for plants is high. This soil is easy to work. Runoff is moderately rapid, and the areas receive excess water from higher slopes.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well. A crop rotation of moderately high intensity can be used. Diversion terraces and graded stripcropping are needed to remove excess water and control erosion. Capability unit IIe-2; woodland suitability group 1.

Meckesville silt loam, 8 to 15 percent slopes, moderately eroded (MeC2).—This moderately sloping soil is near the base of hills and of mountain slopes in the northern part of the county. Its profile is the one described for the series.

Permeability to water and plant roots is moderate. The moisture-holding capacity for plants is high. This soil is easy to work. Runoff is rapid during periods of heavy rainfall.

This soil is suited to most crops commonly grown in the county. Alfalfa grows moderately well. A crop rotation of low intensity is needed. Diversion terraces and graded stripcropping are needed to prevent further erosion. Lime and fertilizer should be applied according to the

needs indicated by soil tests. Capability unit IIIe–2; woodland suitability group 1.

Meckesville silt loam, 15 to 25 percent slopes, moderately eroded (MeD2).—This moderately steep soil is at the base of hills and mountains in the northern part of the county. It ranges from 3 to 5 feet in depth. Numerous fragments of channery sandstone are on the surface and throughout the soil.

Permeability to water and plant roots is moderate, and the moisture-holding capacity for plants is high. Runoff is rapid.

Farming this soil with machinery is fairly difficult because of the steep slope. A rotation of low intensity that includes 3 or more years of hay is needed because of the hazard of erosion. This soil is better suited to permanent hay, pasture, or trees than to row crops. Alfalfa and birdsfoot trefoil grow well, and yields are good. Reseeding the hay or pasture in contour strips helps prevent further erosion. Capability unit IVe–2; woodland suitability group 1.

Melvin Series

The Melvin series consists of poorly drained soils that have a dark-gray surface layer and a grayish silty clay subsoil. These soils are on flood plains of streams that drain the limestone valleys of the county. They formed in alluvium, washed mainly from upland soils underlain by limestone but partly from soils underlain by sandstone and shale.

The plow layer is 9 to 12 inches of very dark grayish-brown silt loam that has fine, granular or subangular blocky structure. It is slightly sticky when wet, contains many roots, and is neutral. The subsoil is dark-gray to gray, sticky silty clay loam or clay loam mottled with streaks and spots of yellowish brown and yellowish red. Roots are few because the water table fluctuates within this layer. Structure is prismatic or blocky, and the soil is neutral to slightly alkaline.

In places stratified layers of sand and gravel that contain lenses of clay are at a depth below 3 to 5 feet. These layers of gravelly material are generally below the permanent water table. In most areas the surface layer is silt loam, but in some places it is clay loam. The texture of the layers underlying the surface layer is silt loam, clay loam, or silty clay loam that contains lenses of sandy clay and sandy clay loam. Depth to mottling ranges from 0 to 12 inches.

Melvin soils are on high flood plains and terraces near the well-drained Huntington and Ashton soils. They are also near the Newark soils, but those soils occupy somewhat higher areas. The Melvin soils are less acid than the Atkins soils and in many places are finer textured.

Melvin soils are in areas on flood plains that have inadequate outlets (fig. 9). Consequently, drainage is difficult. These soils are flooded frequently early in spring. Generally, the crops are not seriously damaged by floodwater, but in some years crops are lost.

Melvin soils are fertile. Their content of organic matter and plant nutrients is high. These soils are easy to work if they are not too moist but they are difficult to work if they are too wet or too dry. They are only suitable for crops that tolerate wetness. Alfalfa does not grow well.

Figure 9.—**A typical Melvin silt loam along Bald Eagle Creek; tile drains have been installed, and the field has been planted to corn.**

Melvin and Newark silt loams (Mn).—These nearly level soils are on flood plains of streams that drain areas of soils underlain mainly by limestone. They are too intermingled to be mapped separately. The profile of the Melvin soil is similar to the one described as typical for the series. A typical profile of a Newark soil is described under the Newark series.

Permeability of these soils to water and plant roots is poor. The water table remains near the surface most of the year, and runoff is slow. After a rain or a flood, these soils dry out slowly. The soils are high in fertility, but the pattern of soils is so complex that it is difficult to utilize the areas to their full potential.

Included with these soils in mapping are small areas of a gently sloping soil.

Crops that tolerate excess moisture are needed on the Melvin and Newark silt loams. A system of open drains, if used with a bedding system, increases the area suited to cultivation and the growing time for crops by improving surface and internal drainage. Generally, applications of lime are not needed. Capability unit IIIw–3; woodland suitability group 11.

Montevallo Series

The Montevallo series consists of shallow to very shallow, well-drained, brownish, moderately sloping to very steeply sloping soils that have a very shaly, medium-textured subsoil. These soils are in upland areas, mainly in the shale hills between Beech Creek and Pine Creek. They formed in material derived from acid gray shale and brown shale.

The surface layer is 4 to 7 inches of brown channery silt loam that is very friable and is strongly acid. The subsoil is yellowish-brown very shaly silt loam that is 5 to 8 inches thick and contains 70 to 90 percent of shale chips. This layer is strongly acid. The substratum is a mass of yellowish-brown shale chips that are coated with silt and range from 3 to 8 inches in thickness. The parent material is broken layers of brownish shale and is permeable to water.

Depth to shale bedrock ranges from 1 to 2 feet. The deeper soils contain more fine silty material than the shallow ones.

The Montevallo soils are near the moderately deep, well-drained Berks soils and the deep, well-drained Hartleton soils.

Montevallo soils have low fertility. Permeability to water is rapid, and ability to hold moisture and plant nutrients is low. The content of organic matter also is low. The woodland cover is mostly Virginia pine but includes a few white pines and some staghorn sumac. The main ground cover is povertygrass, cinquefoil, goldenrod, dewberry, and blackberry.

In this county the Montevallo soils occur in small areas in an intricate pattern with the Berks soils. Therefore, they are mapped only with Berks soils in complexes that are called Berks-Montevallo channery silt loams. These soils are closely associated and are severely eroded or very steep. The descriptions of these mapping units follow the description of the Berks soils in this report.

Morrison Series

In the Morrison series are deep, well-drained sandy loams that are yellowish brown in the plow layer and upper part of the subsoil and red and reddish yellow in the lower part of the subsoil. These soils are on slopes of the rise in the center of Nittany Valley near the western edge of the county. They formed in material weathered from sandy limestone and calcareous sandstone.

The surface layer is 7 to 10 inches of yellowish-brown cherty sandy loam. In a few places sandstone and cherty gravel make up as much as 20 percent of the volume, and as a result, the soil is very friable. The upper part of the subsoil is yellowish-brown cherty sandy loam 8 to 12 inches thick. It is loose to very friable, and in some places fragments of sandstone and chert make up as much as 20 percent of the volume. The lower part of the subsoil is red cherty sandy clay loam that grades to yellowish-red cherty sandy loam with increasing depth. This layer is friable when moist but sticky and plastic when wet. Thickness ranges from 14 to 21 inches. The substratum is strong-brown cherty loam that has numerous black coatings and is 10 inches to several feet thick. This layer is firm when moist and is slightly sticky and nonplastic when wet.

The parent material is weathered sandstone, chert fragments, and impurities of limestone and dolomite from which the lime has been removed by leaching. The underlying rock is permeable and is interbedded with sandstone, which in places is calcareous, and with beds of limestone or dolomite that vary in purity and in chert content.

The Morrison soils are mostly near the Hagerstown soils. They are sandier than those soils.

Permeability is high and the moisture-holding capacity for plants is low in the surface layer and in the upper part of the subsoil, but these are both moderate in the lower part of the subsoil. These soils are droughty and are low in fertility. Runoff is slow, and erosion is seldom a serious hazard. The stones in the soils quickly wear down plowshares and teeth of cultivators, but these soils are easy to work if the areas are not too stony. In areas that have not been limed recently, the soils are very strongly acid to strongly acid. Crops on these soils respond if small amounts of fertilizer are added. The soils leach readily, however, and crops on them are likely to be damaged if large amounts of fertilizer are applied with the seed.

Morrison soils are of little agricultural importance locally. They are somewhat suited to alfalfa and orchards and to similar deep-rooted plants, but they are better suited to woodland. Most areas are in trees, mainly white oak, black oak, scrub oak, ash, white pine, pitch pine, and Virginia pine.

Morrison cherty sandy loam, 3 to 8 percent slopes (MoB).—This gently sloping soil has a profile like the one described for the series. In many places there are large and small sinkholes and slopes are short and broken.

Permeability of this soil is rapid, and the moisture-holding capacity for plants is low. This soil is easy to work, but the low moisture supply during droughts lowers yields.

Included with this soil in mapping are small areas of a stony soil. Also included are areas of a gently sloping soil and of a moderately eroded soil.

Morrison cherty sandy loam, 3 to 8 percent slopes, is better suited to deep-rooted legumes and to orchards than to general crops. The soil leaches easily, and it is therefore better to apply small amounts of lime and fertilizer frequently than to apply large amounts occasionally. Because of the many sinkholes and short, broken slopes, use of contour strips generally is not feasible. Stripcropping and a crop rotation of low intensity are needed for control of erosion. Capability unit IIs-3; woodland suitability group 2.

Murrill Series

The Murrill series consists of deep to very deep, well-drained, nearly level to moderately steep, gravelly soils. These soils are along the edges of limestone valleys and are typically 3 to 6 feet deep. They formed in material weathered from sandstone and shale that was moved by water or gravity onto areas underlain by limestone.

The plow layer is dark yellowish-brown, friable gravelly loam 8 to 10 inches thick. Fragments of sandstone and chips of shale are thickly scattered on the surface. Reaction ranges from strongly acid to neutral. The upper part of the subsoil is 10 to 15 inches of yellowish-brown gravelly clay loam. This layer is friable near the plow layer and increases in firmness with increasing depth. It is 20 to 30 percent fragments of sandstone and shale and is very strongly acid or strongly acid. The lower part of the subsoil is dark yellowish-brown to brown gravelly clay loam 30 inches to 4 feet thick. This layer is firm in place and is very strongly acid. It contains numerous black coatings and in some places has mottles at a depth of 3½ to 4 feet. Also 20 to 30 percent of it consists of fragments of sandstone and shale.

The substratum is strong-brown and brownish-yellow, firm, gritty silty clay loam 1 to several feet thick. It is massive and is very strongly acid. It is underlain by soil material from limestone and by limestone of varying purity.

The Murrill soils are near the Hagerstown, Laidig, and Buchanan soils. They resemble the Laidig soils, but unlike those soils, lack a distinct, reddish color in the lower part of the subsoil. Also, they are not so closely associated with materials that contain lime. Their substratum is less firm than that of the Laidig soils.

Murrill soils are desirable for farming because they have good moisture-holding capacity, are easy to work, and produce high yields of crops. Internal drainage and

permeability to water and plant roots are moderate to a depth of 30 to 36 inches. Below this depth, permeability is slow. Small sinkholes are common. In places where lime has not been applied, these soils are strongly acid.

Most nearly level to sloping fields have been cleared of stones and have been cultivated. Under average management these soils are well suited to general farm crops and to orchards and potatoes. Areas that are moderately steep and very stony are used mainly for pasture or trees. The principal trees in wooded areas are red oak and white oak, but where the soils are more moist and more fertile, walnut, butternut, and elm grow, as well as hickory, maple, beech, juneberry, and dogwood. On fields left idle, cedar begins to grow and povertygrass, goldenrod, broomsedge, dewberry, and blackberry make up the ground cover.

Murrill gravelly loam, 0 to 3 percent slopes (MuA).—This nearly level soil is on the lower parts of slopes along the edges of limestone valleys. At the bottom of the slope the areas fan out over the adjacent Hagerstown soils. Soil that formed mostly in material from sandstone and shale to a depth of 18 inches or more is mapped as Murrill.

Permeability to water and plant roots is moderate, and the moisture-holding capacity for plants is high. Originally the soil was probably strongly acid, but now the reaction depends on the amount of lime that has been applied. The soil is easy to work, and the risk of erosion is slight. Crops on this soil respond well if fertilizer is applied.

All general farm crops, and also potatoes and orchards, grow well on this soil. Yields are high. If lime and fertilizer are added in amounts indicated by soil tests, an intensive crop rotation can be used. Also, crop residues need to be returned to the soil, and cover crops should be grown to help maintain organic matter. Diversion terraces can be used to protect the soil from runoff from higher areas. Capability unit I–1; woodland suitability group 2.

Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded (MuB2).—This gently sloping soil is on toe slopes along the edges of limestone valleys. Its profile is the one described for the series. From 25 to 75 percent of the original surface layer has been removed by erosion. There are stone fences and piles of stones in many places, and small sinkholes are common.

Permeability to water and plant roots is moderate in the plow layer and upper part of the subsoil, but it is restricted in the lower part of the subsoil. The moisture-holding capacity for plants is high. The soil is easy to work, but in places stones on the surface need to be removed. Runoff is rapid in sloping areas. Crops on this soil respond well if fertilizer is added.

This soil is suited to general farm crops, potatoes, and orchards. Yields are high. A crop rotation of moderate intensity is suitable. Diversion terraces and contour stripcropping are needed for control of erosion. Capability unit IIe–1; woodland suitability group 2.

Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded (MuC2).—This sloping soil is on the upper parts of concave slopes in limestone valleys. In places at the top of the slope, this soil is bounded by Laidig soils. From 25 to 75 percent of the original surface layer has been lost through erosion, and stones are piled in many places.

Permeability to water and plant roots is moderate, and the moisture-holding capacity for plants is high. Reaction ranges from strongly acid to neutral, but it depends on the amount of lime that has been added. This soil is easy to work, but in sloping areas runoff is rapid. Crops on it respond well if fertilizer is added.

This soil is suited to hay, pasture, or orchards. General farm crops are also suitable if erosion is controlled. Stone fences make management difficult. A crop rotation of low intensity is suitable. Contour strips and diversion terraces are needed for control of erosion. Capability unit IIIe–1; woodland suitability group 2.

Murrill gravelly loam, 8 to 15 percent slopes, severely eroded (MuC3).—This sloping soil is on the upper parts of concave slopes in limestone valleys. In places at the top of the slope, this soil is bounded by Laidig soils. Most or all of the original surface layer and part of the material from the subsoil have been removed by sheet and rill erosion. Large gullies have been cut in places where drainageways have been altered or left bare of protective cover. There are piles of stones in many places.

Permeability of this soil is moderate, and the moisture available for plants is moderately high. Reaction ranges from strongly acid to neutral, depending on the amount of lime that has been applied. Runoff is more rapid on this soil than on less eroded soils. The soil is easy to work in areas that are not cut by gullies. Crops on it respond well if fertilizer is added.

This soil is suited to hay, pasture, and orchards, but general farm crops can be grown in areas where erosion is controlled. In places stone fences make management difficult. A crop rotation of low intensity is suitable. Contour strips and diversion terraces are needed for the control of erosion. Capability unit IVe–1; woodland suitability group 4.

Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded (MuD2).—This moderately steep soil is on the upper parts of concave slopes along the foot of ridges that surround the limestone valleys. In places at the top of the slope, these soils are bounded by Laidig soils.

Permeability to water and plant roots is moderate. The fertility and moisture-holding capacity for plants are moderately high. Runoff is rapid; consequently, the hazard of erosion increases on long slopes. The soil ranges from strongly acid to neutral, depending on the amount of lime applied. Crops on it respond well if fertilizer is applied.

This soil is suited to long-term hay and pasture crops. It is also suited to general farm crops if erosion is controlled. A crop rotation of low intensity is needed. All crops should be grown in narrow contour strips to help reduce losses of soil and water. Also renovating of areas in hay and pasture should be done in narrow contour strips. Diversion terraces are needed to protect areas that are downslope. Capability unit IVe–1; woodland suitability group 2.

Murrill very stony loam, 0 to 8 percent slopes (MvB).—This nearly level to gently sloping soil is on toe slopes of sandstone ridges along the edges of limestone valleys, mostly below gaps in the ridges. As much as 15 percent of the soil, throughout the profile, is made up of large sandstone fragments and boulders. The surface layer is undisturbed in many places.

Permeability of this soil to water and plant roots is good. Runoff is moderate, and the soil is strongly acid.

This soil has good fertility and moisture-holding capacity, and it is therefore excellent for trees. The use of machinery for tree planting is impractical because of stones. Stones also make renovating areas in pasture and applying lime and fertilizer difficult. Capability unit VIs–1; woodland suitability group 2.

Murrill very stony loam, 8 to 25 percent slopes (MvC).—This moderately sloping to moderately steep soil is on the upper parts of concave slopes in limestone valleys and on fans below gaps in the sandstone ridges. As much as 15 percent of the soil, throughout the profile, is made up of large fragments of sandstone. The surface layer is undisturbed in many places.

Permeability to water and plant roots is good. The soil has good fertility and good moisture-holding capacity but is strongly acid. Runoff is moderate.

Because of its fertility and moisture-holding capacity, this soil is excellent for trees. Stones make it impractical to use machinery for cultivation, pasture management, or tree planting, but the soil can be used for permanent pasture. Capability unit VIs-1; woodland suitability group 2.

Newark Series

The Newark series consists of somewhat poorly drained soils that have a subsoil of grayish-brown silt loam or clay loam. These soils are on the flood plains of all streams in the county that drain areas of soils underlain by limestone (fig. 10).

The plow layer is dark grayish-brown, fine, granular silt loam 6 to 10 inches thick. It is slightly sticky when wet, contains numerous roots, and is neutral. The subsoil is dark yellowish-brown, sticky fine silt loam or clay loam that extends to a depth below 40 inches. It is firm and compact and is mottled with gray and streaks of yellowish brown. This layer is neutral to slightly alkaline and contains no roots. The water table fluctuates within the subsoil. It remains near the surface during periods when moisture is high, and during the summer it is from 24 to 36 inches below the surface. Stratified layers of sand and gravel that contain clay lenses are below a depth of 3 to 5 feet.

Figure 10.—**Landscape of Melvin and Newark soils along Fishing Creek Valley in the Ridge and Valley province. Hagerstown soils are on the sides of the valley; the Dekalb soils are on forested ridges in the background.**

The texture of the surface layer is dominantly silt loam, but it is clay loam in places. In the layers below the surface layer, the texture is silt loam, clay loam, or silty clay loam, and the lenses are of sandy clay or sandy clay loam. Depth to mottling ranges from 6 to 14 inches.

The Newark soils are on flood plains and high terraces near the well drained Huntington and Ashton soils, the moderately well drained Lindside soils, and the poorly drained Melvin soils. The Newark soils are finer textured than the Atkins soils and are better drained and less acid.

Some of the Newark soils are in low areas, and therefore removing excess water by tile drainage or an open drainage system is impossible. Floodwaters lower the productivity of the soils, but generally crops are not seriously damaged by floods. Crops are lost, however, in some wet seasons.

Newark soils are fertile, and their content of organic matter and plant nutrients is high. These soils are easy to work if they are not too moist, but they are difficult to work if they are too wet or too dry. They are suitable only for crops that tolerate wetness. Alfalfa grows poorly on these soils.

In Clinton County the Newark soils occupy small areas that are intermingled with areas of Melvin soils. Therefore, these soils are mapped only with the Melvin soils in an undifferentiated unit that is called Melvin and Newark silt loams. The description of this mapping unit follows that of the Melvin soils in this report.

Nolo Series

The Nolo series consists of poorly drained to somewhat poorly drained, grayish soils that are nearly level and gently sloping. These soils have a very firm, very slowly permeable layer in the lower part of the subsoil. They are in depressions and at heads of springs in the northern two-thirds of the county. Nolo soils formed mainly in material weathered from sandstone but partly in material weathered from shale.

In wooded areas a black, matted layer of organic material 1 inch thick overlies black, friable silt loam 3 to 4 inches thick. Beneath this layer is 3 to 4 inches of dark grayish-brown, friable silt loam or very stony silt loam. All three layers are very strongly acid. The upper part of the subsoil is light yellowish-brown clay loam that is 20 to 30 inches thick. It gradually grades to gray clay loam in the lower part. This layer contains strong-brown, very pale brown, and yellowish-brown mottles that indicate poor drainage. It is firm when moist but is sticky and plastic when wet and is very strongly acid to extremely acid. The lower part of the subsoil is gray to dark yellowish-brown clay loam to sandy clay. It is very firm when moist, is sticky and plastic when wet, and is extremely acid. Thickness ranges from 22 to 36 inches or more.

The underlying rocks are mainly hard, gray sandstone and siltstone, but shale is included. The bedrock is very slowly permeable to water.

The surface layer is silt loam, loam, or sandy loam.

Depth to hard rock ranges from 24 to 60 inches, but it averages from 30 to 36 inches. The firm pan is at a depth ranging from 12 to 24 inches. Depth to mottling ranges from 4 to 10 inches.

Nolo soils are near the moderately deep, well-drained Dekalb soils and the deep, well-drained Hartsells soils. They are also near the moderately well drained to somewhat poorly drained Cookport soils and the very poorly drained Lickdale soils. Nolo soils are more poorly drained than the Cavode soils and have a subsoil that is more compact and coarser textured.

These soils are slowly permeable to moisture, have low water-holding capacity for plants, and are very strongly acid. The rooting zone is very shallow in these soils, and windthrow of trees is common. The surface layer is moderately high in organic matter, and crops on these soils respond slowly if fertilizer is applied.

Nolo soils are suitable to crops that tolerate excessive wetness. Much lime is needed. The woodland on these soils is made up of hemlock, white pine, white oak, pin oak, rhododendron, and dogwood. Generally the water table is within 1 to 3 feet of the surface most of the year.

Nolo silt loam, 0 to 3 percent slopes (NoA).—This nearly level soil is on concave slopes of depressions in upland areas in the north-central and northern parts of the county. Its profile is the one described for the series.

Permeability to water is moderate in the surface layer but is very slow in the subsoil. The soil is very strongly acid. The available water for plants during droughts is low. Runoff is slow.

An open drainage system is needed for removing runoff, and a bedding system that provides slope for drainage is also needed. A crop rotation of low intensity, which includes crops that tolerate wetness, is suitable. Much lime is needed to correct acidity. Capability unit IVw–1; woodland suitability group 11.

Nolo very stony silt loam, 0 to 8 percent slopes (NsA).—This nearly level and gently sloping soil is in some of the depressions in upland soils in the northern part of the county. The areas are around heads of springs and in other places near the Dekalb soils. Many large sandstone fragments are on the surface and throughout the soil. Depth to mottling ranges from 2 to 10 inches.

Permeability to water is slow, and the moisture available for plants during droughts is low. This soil is very strongly acid.

This soil is not suited to cultivated crops, because of the many stones. Its use is limited to native pasture. Capability unit VIIs–2; woodland suitability group 11.

Pope Series

The Pope series consists of deep, well-drained, brownish, nearly level to gently sloping soils that have a gravelly substratum. These soils are on fans built by small streams in areas where they empty into larger streams. Typical areas are on the fans of flood plains, near the gaps, at McElhattan and Woolrich. Pope soils formed in material washed by streams from upland soils underlain by acid sandstone and shale.

The surface layer is dark-brown, very friable loam or very stony loam 8 to 11 inches thick. This layer contains 10 to 20 percent of coarse pebbles and is slightly acid. The substratum is dark-brown silt loam or loam 30 to 40 inches thick. It is medium acid and 20 to 40 percent of it consists of pebbles.

The content of coarse pebbles and cobblestones in the surface layer and through the subsoil ranges from 10 to 60 percent. Depth to stratified gravel and sand ranges from 36 to 72 inches.

Pope soils are similar to the Huntington soils, but they contain more coarse gravel and are more acid. Permeability to water is rapid, and plant roots easily penetrate the substratum. The moisture-holding capacity for plants is moderate. Crops on these soils respond well if fertilizer is added. These soils are seldom flooded. They are easy to work, except in a few places where there are many pebbles and cobblestones.

Most of the Pope soils are used for crops. Yields of corn, oats, wheat, and hay are moderately high. A few areas are in woodland made up of red oak, white oak, sycamore, elm, and cottonwood.

Pope loam, fans, 0 to 3 percent slopes (PoA).—This nearly level soil is on fans of the flood plains where small streams join larger streams. The surface layer and subsoil have weakly developed horizons, and they contain much sand and gravel. The depth to stratified sand and gravel ranges from 36 to 72 inches.

This soil holds moisture moderately well but is acid. During periods of excessive moisture, the water table is at a depth of 30 to 36 inches, but during droughts depth to the water table is much greater. Areas of this soil on the flood plain at Woolrich are flooded infrequently. Crops on the soil respond quickly if fertilizer is applied.

This soil is suitable for any land use. It can be used for all crops commonly grown in the county. A crop rotation of high intensity is suitable. Lime should be applied according to the needs of the crop to be grown. Capability unit I–4; woodland suitability group 1.

Pope loam, fans, 3 to 8 percent slopes (PoB).—This gently sloping soil is on fans of flood plains at the mouths of small streams that drain upland soils underlain by acid sandstone. A large area is on the fan formed by McElhattan Creek at McElhattan.

Internal drainage is rapid, and the available moisture for plants is low during droughts. In summer the water table is very deep, but during seasons of excess moisture, it is near the surface. This soil is strongly acid. Runoff is negligible, and flooding is not a hazard. If enough moisture is available for plants, crops on this soil respond well if fertilizer is added.

Contour stripcropping or contour farming can be used on this soil. Lime should be added according to the needs of the crop to be grown. Capability unit IIe–2; woodland suitability group 1.

Pope very stony loam (Ps).—This nearly level to gently sloping soil is on the fans of flood plains, mainly in mountainous areas where small streams join large streams. Many large boulders and pebbles are on the surface and throughout the soil.

The water available for plants is low during the growing season, and it filters through the soil rapidly.

Included with this soil in mapping are wet spots and small areas of poorly drained soils and of more sandy soils.

Areas of this Pope soil are better suited to trees than to row crops; they are too stony for cultivation. Capability unit VIs–2; woodland suitability group 1.

Purdy Series

The Purdy series consists of poorly drained to very poorly drained, nearly level and gently sloping, gray soils that are prominently mottled with strong brown and yellowish brown. These soils are on high terraces in the vicinity of Beech Creek and Avis.

The plow layer is dark grayish-brown, friable silt loam 8 to 10 inches thick. This layer has good granular structure, becomes sticky when wet, and is medium acid to slightly acid. Beneath the surface layer is light brownish-gray to gray silty clay loam that is 10 to 24 inches thick and contains prominent mottles of strong brown and yellowish brown. It has prismatic structure and is firm when moist but is sticky and plastic when wet. This layer contains a few rounded pebbles and is medium acid to very strongly acid. The substratum is gray gravelly silty clay loam that is 2 to 4 feet thick and contains large, prominent, strong-brown mottles. This layer is firm when moist but is sticky and plastic when wet and is very strongly acid. From 40 to 60 percent or more of this layer consists of fine pebbles.

The texture of these soils is silt loam or silty clay loam. Depth to stratified gravel ranges from 4 to 8 feet. The content of gravel in the lower part of the subsoil ranges from 5 to 40 percent. The color of the surface layer is dark brownish gray, dark grayish brown, or dark gray in places.

The Purdy soils are near the somewhat poorly drained Tygart soils. They are finer textured than the Atkins and Melvin soils.

Permeability of the Purdy soils is slow. Water penetrates and filters through them very slowly, and in droughts they hold only a small amount of moisture available for plants. Runoff is slow, and productivity is low. The Purdy soils are slow to warm up in spring and require a long period to dry out after a rain before they can be cultivated. Consequently, spring planted crops are late. Crops on these soils respond very slowly if fertilizer is applied.

These soils are not well suited to rotational crops. Fall grains generally winterkill, and alfalfa grows poorly. Frequent applications of lime are needed.

Purdy silt loam (Pu).—This soil is the only Purdy soil mapped in the county. It is nearly level and is on high terraces near Beech Creek and Avis. Its profile is the one described for the series.

Water moves over the surface and through this soil very slowly. As a result, the soil is saturated for long periods after rains. This soil is not flooded by high water from the nearby stream, but in places it is covered by runoff from surrounding soils. The content of organic matter in the surface layer is moderate to high. Included with this soil in mapping are small, gently sloping areas.

Purdy silt loam needs a crop rotation that includes several years of hay crops suited to wetness. Alfalfa does not grow well. Drainage terraces, ditches, and a random system of tiling in the wetter areas help remove excess water and thus improve yields. Capability unit IVw–1; woodland suitability group 11.

Riverwash

Riverwash (Ro) consists of poorly drained and very poorly drained alluvium made up of deposits of cobblestones, gravel, and sand that are coated with thin films of clay and silt. Generally the areas are on gravel bars in channels along the shores and on low islands in the Susquehanna River. Most of the materials were deposited recently, and in many places they have been reworked by scouring in the channels. The areas are flooded frequently and have a high water table.

Where the gravel bars are thick enough, they are exposed in islands for 3 to 6 months of the year. The islands are 90 percent coarse gravel and cobblestones. The remaining 10 percent is mostly sand and silt but includes a small amount of clay.

Riverwash is not suitable for agriculture. The gravel bars support a low grade of vegetation, mainly grasses, sedges, alders, yellow birch, and willow. In places the areas are bare. Planting trees and applying lime and fertilizer are not feasible, because of frequent flooding. Capability unit VIIIs–1; woodland suitability group 14.

Rubble Land

Rubble land (Rb) is nearly level to very steep. It is 90 percent or more large boulders of sandstone or quartzite. The areas are in the mountains throughout the county. In places some of the blocks have rounded edges as the result of weathering. A typical area of this land type is on the north side of Bald Eagle Mountain, 2 miles east of Lock Haven.

Many areas are bare of vegetation because there is not enough soil material to support it, but other areas have a thin, scrubby stand of chestnut oak or mountain-laurel. Rubble land has very low moisture-holding capacity for plants, and its fertility is very low. Capability unit VIIIs–1; woodland suitability group 14.

Sequatchie Series

In the Sequatchie series are deep, well-drained, brownish soils that have a brown and reddish-brown, sandy subsoil. These soils are nearly level and are on low terraces along the Susquehanna River and near the town of Avis. They developed in sediments washed mainly from soils underlain by acid shale and sandstone.

The plow layer is 9 to 11 inches of dark grayish-brown, friable loam or fine sandy loam. It has many roots and is very strongly acid. The subsoil is brown or reddish-brown silt loam or sandy loam 20 to 30 inches thick. The lower part is firm, contains many pebbles, and is strongly acid. The substratum is dark-brown, loose gravelly sand that is 80 to 90 percent of gravel.

Sequatchie soils occupy similar areas as the poorly drained Atkins and Purdy soils, but they have a less firm substratum and are less gray. They are browner and more strongly acid than the Pope soils.

Permeability of these soils to water and plant roots is good, and the moisture-holding capacity for plants is moderate to high. These soils are subject to flooding only during major storms. They are fertile soils, but they are strongly acid to slightly acid. Crops on them respond well if fertilizer is added. Moderate applications of fer-

tilizer that is high in potassium are needed. Plant nutrients leach rapidly from the soils.

The woodland is made up of yellow birch, sycamore, black locust, and elm. On idle fields the vegtation is broomsedge, dewberry, cinquefoil, and goldenrod.

Sequatchie loam (Sa).—This nearly level soil is on river terraces that are seldom flooded. The areas are along the Susquehanna River northwest of Lock Haven near the Sequatchie soils on the high terraces. This soil has a finer textured, redder subsoil, but it is otherwise similar to the soil described for the series. The texture of the surface layer is silt loam or loam.

Permeability of this soil to water and plant roots is good. The moisture-holding capacity for plants is high. Flooding is infrequent and causes little damage to crops. Crops on this soil respond well if fertilizer is added, particularly if the fertilizer has a high content of potassium.

This is a desirable soil for farming. Alfalfa grows moderately well to well. A crop rotation of high intensity is suitable. Capability unit I–2; woodland suitability group 1.

Sequatchie fine sandy loam, high (Sf).—This nearly level soil is on high terraces above the flood level of the Susquehanna River. It is coarser textured but is otherwise similar to the soil described for the series.

Permeability of this soil to water is moderate, and plant roots penetrate the soil easily. Ability to hold moisture for plants during the growing season is high. Crops on this soil respond well if fertilizer is added, particularly if the fertilizer has a high content of potassium.

This soil is suited to all crops commonly grown in the county. Alfalfa grows moderately well if enough lime is applied. Birdsfoot trefoil is also suitable. A crop rotation of high intensity can be used. Capability unit I–2; woodland suitability group 1.

Stony Alluvial Land

Stony alluvial land (Sn) is a miscellaneous land type made up of very stony, cobbly, gravelly, and sandy material in nearly level to gently sloping areas. It is on narrow flood plains of turbulent mountain streams and consists of mixtures of soils that are well drained, moderately well drained, poorly drained, and very poorly drained.

This land type contains many cobblestones, pebbles, and other stones. Many small areas are bare. The soil material has been deposited so recently that the process of soil formation has not taken place. Periodically, the areas are flooded by a rushing, destructive torrent. A layer of organic matter ½ to 2 inches thick is on the surface in places. The material in this layer ranges from undecomposed leaves from last year's growth to material that is thoroughly decomposed. The water table is generally 1 to 2 feet below the surface.

In places Stony alluvial land is adjacent to the well-drained Pope soils. It is also near the somewhat poorly drained to poorly drained Atkins soils. This land type contains more cobblestones and pebbles than Pope very stony loam and has much less fine material.

Included with this land type in mapping are small areas of poorly drained, very stony soil derived from alluvium in depressions and old oxbows. Also included are small areas of well drained, moderately well drained, and somewhat poorly drained soils that are between these areas.

This land type is in trees, mainly sugar maple, hemlock, yellow birch, black birch, and sycamore. It should remain in trees. The understory is mainly rhododendron, but black alder grows in the wetter places. Capability unit VIIIs–1; woodland suitability group 14.

Stony Land

Stony land (So) is a miscellaneous land type that consists of well-drained, nearly level to extremely steep, extremely stony land covered with large boulders and slabs of sandstone and quartzite. Between the blocks of sandstone and quartzite, Stony land has 1 to 3 inches of decayed organic matter made up of leaves, twigs, and fine roots. Below this is sandy material. The stones in this land type make up from 15 to 90 percent of the material on the surface and below it. In the southern part of the county in the Ridge and Valley province, large areas have formed in material weathered from quartzite. In those areas the surface layer is thinner and the subsoil more shallow than in similar areas in the northern part of the county.

Stony land is near the moderately deep, well-drained Dekalb and Lehew soils. It contains more coarse rock fragments than the Dekalb soils and is coarser textured and more shallow to hard rock.

Permeability to water is extremely rapid, and the moisture-holding capacity is very low. Also, fertility is very low. The woodland is made up mostly of poorly formed chestnut oak, and the understory is mainly mountain-laurel. The vegetation in some areas is principally mosses and blueberries. Capability unit VIIIs–1; woodland suitability group 14.

Strip Mines

Strip mines (St) consists of areas from which the original covering of soil material and rock above coalbeds has been removed by mining. Soil material, shale, sandstone, and carbonaceous shale have been piled in high mounds on the areas. In many areas the mounds are continuous and follow the contour of the hill. The area from which the coal has been removed in the last cut remains as a trench throughout the coalbed. A high, almost vertical wall remains on the uphill side of the trench. Slopes are generally steep, but in places the trench has been blackfilled, and the original contour has been restored.

Strip mines contains many large stone fragments of shale and sandstone, which, when exposed, break down rapidly. The acidity resulting from weathering of the carbonaceous shale and waste coal in Strip mines varies. In many places this land type is extremely acid, but acidity is reduced by leaching. The dark-colored, bare shale in Strip mines retains the heat of the sun, and as a result, temperatures are high on the surface.

Most areas of this land type are suited to vines, trees, and shrubs. The soils in backfilled areas are suited to cultivation if lime and fertilizer are added. Not assigned to a capability unit; woodland suitability group 13.

Tygart Series

The Tygart series consists of somewhat poorly drained to moderately well drained, brownish, nearly level soils. These soils are on old stream terraces near the towns of Avis and Beech Creek. They formed in material weathered from noncalcareous clay and silt.

The plow layer is dark grayish-brown, friable silt loam that is 7 to 9 inches thick. It is very strongly acid. In the upper part of the subsoil is light yellowish-brown silty clay loam 6 to 8 inches thick. This layer is sticky and slightly plastic when wet and is very strongly acid. In the lower part of the subsoil is strong-brown, firm silty clay 8 to 10 inches thick. It contains gray mottles, is sticky and plastic when wet, and is very strongly acid. The substratum is a mixture of strong-brown and gray, firm fine gravelly silty clay. It is sticky and plastic when wet and contains about 40 percent of fine pebbles. This layer extends to a depth of 36 inches or more and is very strongly acid.

Except where it grades to silty clay loam in eroded areas, the texture of the surface layer is silt loam. In the surface layer and subsoil, the content of fine gravel ranges from 0 to 3 percent of the volume. In the substratum, however, it ranges from 10 to 70 percent. Depth to bedrock ranges from 48 to 72 inches or more.

The Tygart soils are in areas similar to those occupied by the poorly drained Purdy soils. They are similar to the Atkins and Melvin soils but are finer textured. Also, they are less gravelly and are more firm.

Water filters through the Tygart soils slowly to very slowly and makes them too wet for plowing for long periods. The moisture-holding capacity for plants is moderately low, and the soils are very strongly acid. These soils are easy to work, but they are sticky and plastic if worked when too moist. These soils warm up late in spring, and crops on them respond slowly if fertilizer is added. The soils are fine textured, which makes tile drainage difficult.

Tygart silt loam (Ty).—This is the only Tygart soil mapped in the county. Its profile is the one described for the series. The soil is on high terraces above the present high water mark, and it is seldom flooded except by runoff from surrounding hills. It is in slightly concave areas on the terraces where runoff is very slow. Permeability to water and plant roots is slow. The soil is very strongly acid.

This soil is moderately well suited to most farm crops commonly grown in the area, and yields are moderate. Alfalfa, winter grain, and other deep-rooted legumes grow poorly. Where the areas are large enough, a system of open ditches helps increase productivity. Tile can be used to drain the wetter spots. Lime should be added to correct acidity. Capability unit IIIw–1; woodland suitability group 9.

Ungers Series

In the Ungers series are moderately deep, well-drained, gently sloping to moderately sloping, reddish soils that have a loamy subsoil. These soils formed in the uplands in material underlain by fine-grained sandstone, acid red shale, and siltstone.

In wooded areas is dark-brown organic material ½ to 2 inches thick over black, friable loam 1 to 3 inches thick. Below this is dark-brown, friable silt loam 3 to 5 inches thick. The lower part of the surface layer is reddish-brown, friable loam 4 to 7 inches thick. The combined thickness of these layers is about 11 inches, and they are very strongly acid to extremely acid. The subsoil is reddish-brown, friable silt loam to sandy loam that is 14 to 24 inches thick and contains from 5 to 15 percent of coarse fragments. It is very strongly acid. The substratum is reddish-brown channery sandy loam that contains 30 to 40 percent of coarse fragments. The underlying rock is reddish-brown or dark reddish-brown, medium-grained sandstone that is moderately permeable to water.

The texture of the surface layer is silt loam where the underlying material is mostly red shale and is loam or sandy loam where it is dominantly red sandstone. In places much gray sandstone and quartzite are on the surface. Depth of the soil ranges from 2½ to 3 feet.

Ungers soils are in areas similar to those occupied by the moderately deep, well-drained Lehew and Dekalb soils. They are deeper and finer textured than the Lehew soils and contain fewer coarse fragments. They are not so fine textured as the Upshur soils.

Permeability to water and plant roots is good, and the moisture-holding capacity for plants is moderately high. The soils are easy to work. Crops on them respond well if fertilizer is added.

These soils are suited to most crops commonly grown in the area. The woodland is red oak, white oak, red maple, and black cherry, and the understory is mountain-laurel, sweetfern, sassafras, and blueberry.

Ungers loam, 3 to 8 percent slopes (UnB).—This gently sloping soil is in upland areas underlain by red sandstone, siltstone, and shale. Its profile is the one described for the series.

Permeability of this soil to water and plant roots is moderate, and the moisture-holding capacity for plants is moderately high. Runoff is negligible in wooded areas. The soil is easy to work, and crops on it respond well if fertilizer is added.

Included with this soil in mapping are small, level areas of Ungers loam.

This Ungers soil is suited to most crops commonly grown in the area, but many areas are wooded. Alfalfa grows moderately well if lime is applied. A crop rotation of moderate intensity is suitable, but diversion terraces and contour striperopping are needed for the control of runoff. Capability unit IIe–2; woodland suitability group 1.

Ungers loam, 3 to 8 percent slopes, moderately eroded (UnB2).—This gently sloping soil is in upland areas underlain by red sandstone, siltstone, and shale. Much of the acreage has been cultivated and the original layers have been mixed by plowing to form the present surface layer, which is 4 to 6 inches thick. The soil is otherwise similar to the one described for the series.

Permeability of this soil to water and plant roots is moderate. The moisture-holding capacity for plants is moderately high. Runoff is medium. Crops on this soil respond well if fertilizer is added.

Included with this soil in mapping are small areas of severely eroded Ungers soils.

This Ungers soil is suited to most crops commonly grown in the county. Potatoes grow well. Alfalfa grows moderately well if lime is added. A crop rotation of moderate intensity is suitable. Diversion terraces and contour stripcropping are needed for the control of runoff and to reduce erosion. Capability unit IIe-2; woodland suitability group 1.

Ungers loam, 8 to 15 percent slopes (UnC).—This moderately sloping soil is in upland areas underlain by red sandstone, siltstone, and shale. Its surface layer is similar to that of the soil described for the series. Depth of this soil, however, is about 8 inches less, and there are more stones and fragments of channery sandstone on the surface.

Permeability of this soil to water and plant roots is moderate. The moisture-holding capacity for plants is moderate, and runoff is medium during heavy rains. Crops on this soil respond well if fertilizer is added.

Included with this soil in mapping are small areas of eroded Ungers loam.

This Ungers soil is suited to most crops commonly grown in the area. Birdsfoot trefoil is suitable. Alfalfa grows moderately well if lime is added. A crop rotation of low intensity is suitable, but diversion terraces and contour stripcropping are needed for the control of runoff and to reduce erosion. Capability unit IIIe-2; woodland suitability group 1.

Upshur Series

In the Upshur series are deep, well-drained, reddish, nearly level to gently sloping soils that have a fine-textured, plastic subsoil. They are in upland areas in the northern part of Clinton County. The soils formed in material weathered from acid, red clay shale.

The plow layer is reddish-brown, friable silt loam that is 6 to 8 inches thick. It is very strongly acid. Below this layer is 5 to 7 inches of reddish-brown, friable, strongly acid silt loam. The subsoil is dark-red silty clay 15 to 25 inches thick. It is sticky and plastic and if exposed, breaks into firm, medium and coarse blocks. The parent material is red, weathered clay shale. It contains streaks and mottles of olive and gray and fragments of gray, fine-grained sandstone.

The texture of the surface layer ranges from loam to silty clay loam. Depth of the soil ranges from 30 to 60 inches. In places where the Upshur soils are near the Dekalb soils, the subsoil is generally sandy clay loam. The Upshur soils in this county are underlain by acid red shale, but normally Upshur soils overlie calcareous shale, and the lower part of their subsoil is therefore not so acid as that of the soil here described.

Upshur soils occur as islands of red soils within areas of other soils in this county. They are surrounded by deep, well-drained Hartsells soils, deep, moderately well drained to somewhat poorly drained Cookport soils, and moderately deep, well-drained Dekalb soils. Small areas of moderately deep, well-drained Lehew soils are also near these soils. The Upshur soils are redder and are not so deep as the Ungers soils, and they have a finer textured subsoil.

Water moves slowly through the subsoil of these soils. The ability to hold moisture for plants is low to moderate. Upshur soils are easy to plow in uneroded areas. In eroded areas the subsoil is near the surface, and the soils are difficult to work because they are plastic and sticky.

Upshur soils are suited to most crops commonly grown in the county. Alfalfa grows poorly in some areas, but where the substratum is calcareous it grows very well. The woodland is mainly white oak, red oak, and red maple, but in some places it is beech, hickory, dogwood, and juneberry.

Upshur silt loam, acid substratum, 2 to 8 percent slopes (UpB).—This moderately sloping soil is the only Upshur soil mapped in the county. It is in the uplands in the northern part of the county, and its profile is the one described for the series.

The moisture-holding capacity for plants is moderate. The soil stays wet moderately late in spring because it contains much clay. It erodes readily but is moderately productive.

All farm crops commonly grown in the county grow moderately well on this soil. A crop rotation that includes 2 to 3 years of hay is suitable. Diversion terraces, contour stripcropping, and other intensive practices are needed for the control of erosion. Capability unit IIe-2; woodland suitability group 1.

Watson Series

In the Watson series are deep, moderately well drained, brownish, nearly level to gently sloping soils that have a firm, clayey subsoil. These soils are in the uplands on the shale hills between Beech Creek and Pine Creek. They formed in a mixture of material derived from acid gray shale, sandstone, and quartzite.

The plow layer is dark yellowish-brown, friable silt loam 8 to 11 inches thick. This layer contains many roots and is medium acid. The upper part of the subsoil is brownish, friable silty clay loam 7 to 12 inches thick. It contains some pebbles, is sticky and plastic when wet, and is very strongly acid. The lower part of the 12 to 20 inches of subsoil is brownish, firm, slowly permeable clay loam. It is prominently mottled, contains many fine pebbles, and is very strongly acid to extremely acid. The substratum is clay and very soft, thin pieces of shale. The material is strongly mottled, is sticky and plastic, and is medium acid.

The texture of the surface layer is loam, gravelly loam, gravelly silt loam, or silt loam. The subsoil is reddish brown in places. Depth to the firm lower part of the subsoil ranges from 25 to 35 inches. Depth of the soil ranges from 30 to 60 inches.

The Watson soils are near the moderately deep, well-drained Berks soils and the poorly drained Brinkerton soils. They have a redder hue than the Comly soils and are finer textured.

Watson soils are moderately permeable to water to a depth of 18 to 20 inches but are slowly permeable below that depth. The moisture-holding capacity is moderate to moderately high. These soils are easy to work, but small wet spots are a problem.

General farm crops grown in the area are suitable for these soils. The woodland is red oak, white oak, red maple, jack pine, and white pine.

Watson silt loam, 0 to 5 percent slopes (WoA).—This is the only Watson soil mapped in the county. Its profile is the one described for the series. The areas are level and

nearly level and are in the uplands on shale hills north of Lock Haven. Some of the areas are in slight depressions.

Permeability to water is moderate in the surface layer, but it is slow in the subsoil. The moisture-holding capacity for plants is moderately high. Runoff is slow. The soil is very strongly acid. It can be cultivated 5 to 10 days later in spring than a well-drained soil, and spring grains are generally planted late. Crops on the soil respond moderately well if fertilizer is applied.

Yields of winter grain on this soil are lowered by frost heaving. Birdsfoot trefoil grows well, but alfalfa grows moderately well to poorly. A crop rotation of moderate intensity is suitable if graded strips are used. Tile can be used in wet spots for draining the soil and to increase yields. Capability unit IIw–2; woodland suitability group 9.

Whitwell Series

The Whitwell series consists of deep, moderately well drained to somewhat poorly drained, brownish, nearly level and slightly sloping soils that have a firm subsoil of clay loam. These soils formed in alluvium on the stream terrace near Avis.

The plow layer is dark-brown, very friable silt loam that is moderately acid and is 0 to 9 inches thick. The upper part of the subsoil is strong-brown, very strongly acid, friable silt loam 9 to 14 inches thick. This layer contains a few pebbles. The middle part of the subsoil is strong-brown, very strongly acid, firm clay loam that is 5 to 8 inches thick and contains a few pebbles. The lower part of the subsoil is yellowish-red, very strongly acid, firm clay loam 14 to 20 inches thick. This layer contains streaks of brown and gray and has pebbles in places. The substratum is yellowish-red gravelly and cobbly sandy loam below a depth of 34 to 38 inches. It is mottled with brown and gray and is very strongly acid.

The texture of the surface layer is dominantly silt loam, but in small areas it is fine sandy loam or loam. In places near the hillsides, the soil is covered by shaly material that has moved down to the bottom of the slope. Whitwell soils are near the well-drained Sequatchie soils, the somewhat poorly drained Tygart soils, and the poorly drained Purdy.

These soils hold moisture for plants moderately well. They remain wet a week or 10 days longer in spring than the well-drained Sequatchie soils because their firm subsoil restricts the downward movement of water. These soils are easy to work. Crops on them respond well if fertilizer is added, particularly if the fertilizer has a high content of potassium.

These soils are suited to most crops commonly grown in the county. The main vegetation in fields left idle is broomsedge, dewberries, black locust, and povertygrass.

Whitwell silt loam, 0 to 5 percent slopes, moderately eroded (WhA2).—This is the only Whitwell soil mapped in the county. It is nearly level and is on the terrace plain near Avis. Its profile is the one described for the series. Permeability to water is moderate to moderately rapid in the surface layer of this soil, but it is moderate to slow in the subsoil. The moisture-holding capacity for plants during droughts is high. Runoff is slow.

Included with this soil in mapping are small areas of soil that have gentle and moderate slopes.

This Whitwell soil is suited to most crops commonly grown in the county. In the wetter areas alfalfa grows moderately well to poorly. Yields of winter grain are lowered in some places by frost heaving. A crop rotation of moderate intensity can be used. Small wet areas should be tiled. Capability unit IIw–2; woodland suitability group 9.

Wiltshire Series

In the Wiltshire series are deep, moderately well drained, nearly level to gently sloping soils that have a firm, compact layer in the subsoil. These soils are in depressions and coves on the flood plains of intermittent streams in Nittany and Sugar Valleys in the southern part of the county. They formed in soil material washed from surrounding areas of limestone soils.

The plow layer is dark-brown, friable silt loam 6 to 8 inches thick. This layer contains a few small fragments of standstone, shale, and chert. Below this is yellowish-brown silt loam 3 to 5 inches thick. Both layers are slightly acid to neutral. The upper part of the subsoil is yellowish-brown, friable silty clay loam 6 to 18 inches thick. Fine, distinct mottles of gray and brown are below a depth of 24 to 36 inches. Small fragments of chert, sandstone, and shale are in the subsoil. Many roots are in the upper part, and a few are in the lower part. The subsoil is slightly acid to neutral. The substratum is dark yellowish-brown, is firm and weakly cemented, and is 20 to 30 inches thick. This layer contains a few to many pebbles in places. It is medium acid.

Except where clay from surrounding soils has been recently deposited, the texture of the surface layer is silt loam. The subsoil varies in texture and in content of chert, gravel, and shale, according to the texture of the surrounding soils and their content of coarse fragments. Depth to hard rock ranges from 4 to 8 feet; it averages about 6 feet.

Wiltshire soils are near the deep, well-drained Hagerstown soils and the Huntington soils formed in local alluvium. Their subsoil is more yellow and is coarser textured than that of the Hagerstown soils.

Permeability is moderate to a depth of 20 to 24 inches and is slow below that depth. The moisture-holding capacity is high. Runoff is very slow in a few nearly level areas where water remains on the soils for a day or two. Crops on these soils respond well if fertilizer is added.

Wiltshire silt loam, 0 to 3 percent slopes (WtA).—This nearly level soil is in swales and depressions near the bottoms of slopes. Depth to mottling and to the firm, compact layer, or hardpan, is 16 to 20 inches. The plow layer is 10 to 14 inches thick.

Permeability of this soil to water and plant roots is moderate, and the moisture-holding capacity for plants is high. Runoff is slow. As a result, soil material is deposited, and erosion is not a hazard. In some places water on this soil is ponded for short periods. In some areas during periods of excessive rainfall, plants become yellow. In some years crops are damaged in places by runoff from surrounding areas, and yields are lowered. Crops respond well, however, if fertilizer is added.

Included with this soil in mapping are small areas of wetter soils.

Most crops suited to the county can be grown on this Wiltshire soil, and alfalfa grows moderately well. A crop rotation of high intensity can be used if lime and fertilizer are applied in amounts indicated by soil tests. Growing cover crops and returning crop residues to the soil help to maintain organic matter. Diversion terraces help to remove excess water. Capability unit IIw–1; woodland suitability group 10.

Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded (WtB2).—This gently sloping soil is in swales and depressions and along intermittent drainageways. Its profile is the one described for the series.

Permeability to water and plant roots is moderate. Ability to retain moisture for plants during droughts is good. The acidity varies according to the amount of lime applied. Runoff is moderate. Crops on this soil respond well if fertilizer is applied.

Most of this soil is in crops. Yields are moderately high. A crop rotation of moderate intensity is suitable. Diversion terraces and graded stripcropping are needed for the control of runoff and to reduce erosion. Capability unit IIe–3; woodland suitability group 10.

Formation, Morphology, and Classification of Soils

In this section the factors that have affected the formation of the soils in Clinton County are discussed. Also discussed is the classification of the soils by higher categories.

Formation of Soils

Soils are mixtures of fragmented and partly or completely weathered rocks, minerals, organic matter, water, and air that occur in varying proportions. They have more or less distinct horizons that formed under the influence of the soil-forming factors of their environment. The important factors in the formation of soils are the parent material, the climate, the relief or lay of the land, the plant and animal life, and time. The kind of soil that forms in any given environment depends on the interaction of these five factors.

Soil formation begins with physical weathering. Large pieces of rock are broken into smaller pieces by frost wedging, differential expansion, unloading, colloidal plucking, hydration, and other forces, and the rocks and fragments of rock are reduced to the size of particles of sand and silt. In this way, an unconsolidated layer of material is formed in which plants can grow. Organic matter is added to the material when plants and animals die.

Chemical weathering of rock fragments and organic matter occurs by solution, carbonation, oxidation, reduction, and the action of weak acids. Some rock fragments are reduced to particles the size of clay. Also, nitrogen, phosphorus, potassium, sulfur, calcium, magnesium, iron, molybdenum, zinc, manganese, and other elements are released in such form that they are eventually available to plants.

Parent materials.—In Clinton County the kind of rock from which the parent materials developed has had an important effect on the kind of soil that has formed. Parent materials are the unconsolidated mass from which the solum develops. Parent rock is the geologic material from which the parent material was formed by weathering. In some soils in Clinton County there is little or no partly weathered, unconsolidated material between the solum and the parent rock. Here soil formation has kept pace with weathering.

In general, the parent materials of the soils of Clinton County can be grouped into two classes: (1) material that formed in place through the disintegration and decomposition of hard country rock in place, and (2) material that has been transported from one place and deposited in another by gravity, water, wind, or ice. Most of the soils in Clinton County formed on parent materials derived from the disintegration and decomposition of local country rock in place. The acreage of soils formed from transported and redeposited material is small, but the soils are important. The texture, color, content of calcium, permeability, and other properties of the soils are affected by the kind of material from which the soil formed. Climate and vegetation were fairly uniform throughout the county and caused little difference among the soils; parent material therefore appears dominant in the formation of the soils.

Climate and soils.—Climate affects the formation of soils through its influence on the rate of weathering of rocks and on the decomposition of minerals and organic matter. It also affects biological activity in the soils and the leaching and movement of weathered materials.

In Clinton County the area south of the Allegheny escarpment has a longer frost-free season and a higher average temperature than the area in the Allegheny Plateau in the northern part of the county. Because of these climatic differences, soils in the southern part of the county are more deeply weathered and are more thoroughly leached than soils in the northern part. The nearness of the glacial ice fronts to the northern part of the county caused severe climatic conditions, which influenced the soils there.

Plant and animal life.—Plants and animals are active in the soil-forming processes. The changes they bring about depend mainly on the kinds of life processes peculiar to each. The kinds of plants and animals that live on and in the soil are affected, in turn, by the climate, the parent material, relief, and age of the soil.

Many of the soils in Clinton County formed under forest. Some of the trees were such hardwoods as maple, cherry, and aspen, and others were such softwoods as pine and hemlock. Because of differences in composition, hardwoods and softwoods have somewhat different effects on the formation of soils. In general, however, leaves, twigs, roots, and entire plants accumulate on the surface of forest soils and then decompose as a result of the action of microorganisms, earthworms, and other forms of life. Through this process organic matter is added to the soils. The amount of organic matter is likely to be greater in hollows and depressions, where the soils remain moist, than the amount on slopes. Also, the uprooting and windfall of trees have a decided influence on formation of soils through mixing the soil and loosening the underlying material.

Small animals, insects, grubs, worms, fungi, and microbes also influence the formation of soil by mixing or-

ganic matter into the soil and by helping to break down plant remains. In addition, man, through plowing and other agricultural practices, hastens the rate of oxidation in soils. He increases the content of organic matter by adding such materials as manure and fertilizer to the soil. Also, tillage and earth-moving practices carried out by man cause changes in the soil profile by creating artificial horizons, destroying natural horizons, or completely mixing and obscuring the natural soil profile.

Relief.—Differences in relief have a strong influence on the kind of soil that develops from a given parent material. Relief also directly affects surface drainage and the rate of erosion. In general, in Clinton County the soils on steep slopes are shallow, and the soils in nearly level to moderately sloping areas are moderately deep to deep.

Where the relief is fairly smooth, but not level enough to keep water standing, such as in rounded and hilly to rolling areas, the water runs off and the soils are generally well drained. In places the soils may even be droughty. If the relief is nearly level and the slopes are concave, water tends to remain on the surface or in the soil for longer periods. Surface and subsurface water may also accumulate in these areas and increase the amount of water so that it becomes excessive during some parts of the year. Unless the country rock and underlying materials are very permeable, soils that develop in these areas are wet.

Time.—Time is required by the active agents of soil formation to form soils from parent material. The degree of profile development generally indicates the age of a soil. Alluvial soils are young because they formed on flood plains in transported materials that have not been in place long enough for distinct horizons to form. Organic matter has accumulated on the surface of such soils, but there has been little weathering of the material since it was deposited. Also, clays have not formed or moved downward sufficiently to develop a textural B horizon. These soils generally contain minerals that are more easily soluble or weathered than those in other kinds of soils. The minerals contribute plant nutrients to the soils and make them fertile.

In Clinton County soils on the uplands are generally older than soils on the bottom lands. Also, upland soils that have not been glaciated have more strongly expressed horizons and generally have more evidence of clay movement than soils that were disturbed by glaciation.

Processes of soil formation

As the result of processes that cause gains and losses, different horizons are formed in soil profiles. Ordinarily, gains to the soils are made in the form of organic matter, minerals, or nutrient elements. Losses from the soil occur when minerals are dissolved and leached from the soil in solution, nutrient elements are removed by plants, the finer particles of the soil are removed by erosion, and gases escape when organic matter decomposes.

Transfer of material from one part of the soil to the other is common in most soils. Organic matter is moved from one part of the profile to another in suspension or solution. Calcium is leached from the surface layer and is held by the clay in the subsoil or lower part of the profile. Bases are moved when they are absorbed by plant roots and stored in the stems, leaves, and twigs of plants. When the plants die and decay, they return the calcium and other elements to the soil that were formerly stored in their stems, leaves, twigs, and roots.

As chemical weathering takes place, transformations occur. An example is the release of iron, aluminum, calcium, and other elements from the primary and secondary minerals in the soil (*18*). In a well-drained soil, yellow, brown, and red colors gradually replace the gray or blue colors of the relatively unweathered materials as they are exposed to weathering. The colors indicate the release of iron or the oxidation of ferrous oxides to ferric oxides in the presence of adequate supplies of oxygen.

The soil profile

As the soil develops, layers, called horizons, are formed. These gradually develop properties that are recognizable and can be identified in the soil.

Under forest vegetation the first horizons to become recognizable are usually the dark-colored organic layers, called the O1 or O2 horizon, where organic matter has accumulated. The surface layer of mineral soil is a dark-colored layer called the A1 horizon. As soluble materials are removed, a light-colored, eluviated layer generally develops under the layer that is stained with organic matter. The quartz and other resistant minerals that remain form a light-colored layer called the A2 horizon.

In many soils, after passage of sufficient time, a B horizon develops under the A2 horizon. In the B horizon colors are stronger than in the A2 horizon. Properties of the B horizon are influenced by an illuvial accumulation of clay, aluminum, iron, and other materials. Some of the clay, however, may have been deposited in the original parent material, or it may have formed through weathering in place.

Deeper in the profile, the B horizon is lighter colored and in most places coarser textured, and it finally blends with the unconsolidated material weathered from the bedrock or other material. This layer, the C horizon, which lies beneath the B horizon, consists of material that is either like or unlike the material from which the solum is presumed to have formed. It is relatively little affected by the processes that formed soil. The C horizon is not a part of the true soil, or solum, which is composed of the A and B horizons.

Classification of the Soils

The soils of Clinton County have been grouped according to two classification systems. These are the great soil group and the soil catena. They are discussed in the following pages.

Great soil groups

A great soil group consists of soils that are similar in several fundamental characteristics. They have the same kinds and numbers of horizons, although corresponding horizons are not necessarily of the same thickness, nor are they expressed with the same degree of clarity. In some characteristics the soils of any given group may differ considerably. Many soils have some of the significant characteristics of more than one great soil group and are called intergrades.

The soil series of Clinton County are classified by great soil groups according to the classification given in the 1938

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Yearbook of Agriculture (*14*) and modified by Thorp and Smith (*12*). The Sols Bruns Acides were described by Baur and Lyford (*3*).

The great soil groups and the soil series in each are discussed in the pages that follow. A detailed description of a profile for each soil series is given in the subsection "Detailed Descriptions of Soil Profiles."

The following list shows the classification of the soils of Clinton County.

Great soil group—	*Series*
Gray-Brown Podzolic soils	Upshur.
Gray-Brown Podzolic soils (intergrading to Red-Yellow Podzolic soils).	Albrights, Cavode, Comly, Cookport, Gilpin, Hagerstown, Hartleton, Leadvale, Leck Kill, Meckesville, Morrison, Murrill, Ungers, Wiltshire.
Gray-Brown Podzolic soils (intergrading to Alluvial soils).	Ashton, Sequatchie, Whitwell.
Red-Yellow Podzolic soils	Allenwood, Buchanan, Hartsells, Laidig, Watson.
Red-Yellow Podzolic soils (intergrading to Planosols).	Tygart.
Sols Bruns Acides	Berks, Chenango, Dekalb, Lehew, Leck Kill.
Podzols	Leetonia.
Low-Humic Gley soils	Andover, Atkins, Brinkerton, Guthrie, Melvin, Nolo, Purdy.
Humic Gley soils	Lickdale.
Alluvial soils	Barbour, Basher, Huntington, Lindside, Newark, Pope.
Lithosols (intergrading to Sols Bruns Acides).	Klinesville, Montevallo.

Gray-Brown Podzolic soils.—In this county the Upshur soils are representative of the Gray-Brown Podzolic great soil group. The soils of this group are weathered to considerable depth. A typical soil of this group in an undisturbed area has a thin litter of leaves on the surface. Below the layer of leaves is a dark layer of humus that is 1 to 2 inches thick. This is underlain by a paler, leached layer that extends to a depth of 8 to 12 inches. When the soil is plowed, the soil material in these two layers is mixed together and forms a dark plow layer, or Ap horizon. The B horizon, or subsoil, is distinctly finer textured and brighter colored than the A horizon, or surface soil. The subsoil is lighter colored and coarser textured where it grades to a partly weathered layer, or C horizon.

The Gray-Brown Podzolic soils are generally less weathered and less acid than the Red-Yellow Podzolic soils. As a rule, they contain more mineral elements that dissolve or decompose more easily than do the Red-Yellow Podzolic soils. Base saturation increases with depth in the Gray-Brown Podzolic soils, and the parent material is calcareous in many places.

Gray-Brown Podzolic soils (intergrading to Red-Yellow Podzolic soils).—Many of the soils of the county have characteristics of both the Gray-Brown Podzolic and Red-Yellow Podzolic great soil groups. They are classified as Gray-Brown Podzolic soils intergrading toward the Red-Yellow great soil group. The Albrights, Cavode, Comly, Cookport, Gilpin, Hartleton, Hagerstown, Leadvale, Leck Kill, Meckesville, Morrison, Murrill, Ungers, and Wiltshire soils are in this great soil group.

The soils in this group are well drained to somewhat poorly drained. Some are deep and others are moderately deep. All are leached, are moderately acid to strongly acid, and have a subsoil finer textured than their surface soil. The subsoil of the Hagerstown soils is red and yellow. These soils are commonly classified as Reddish-Brown Lateritic soils intergrading to Red-Yellow Podzolic soils. In Clinton County, however, the Hagerstown soils generally have an A2 horizon and are classified as Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

The reddish, well-drained, deep soils in this group are the Meckesville and Ungers soils. These soils developed on acid sandstone and shale. Soils formed on somewhat similar parent material are the Albrights soils, which are reddish and are moderately well drained. The well drained Gilpin, the moderately well drained Cookport and Wiltshire, and the somewhat poorly drained Cavode soils formed mainly in material from acid gray sandstone but partly in material from shale. Moderately deep soils formed in material from acid, brown and gray shale are the well drained Hartleton and the moderately well drained Comly. Moderately deep soils that formed in material from limestone are the Hagerstown and Murrill soils. Deep soils formed in material from calcareous sandstone are the Morrison soils.

Gray-Brown Podzolic soils (intergrading to Alluvial soils).—The soils of the Ashton, Sequatchie, and Whitwell series are in this group. These soils are similar to the soils in the Alluvial great soil group, but they are on flood plains or terraces and seldom receive deposits of new material. Consequently, weathering and translocation of clay have occurred and a textural B horizon has developed.

Red-Yellow Podzolic soils.—The soils of the Allenwood, Buchanan, Hartsells, Laidig, and Watson series are in the Red-Yellow Podzolic great soil group. Typically, Red-Yellow Podzolic soils are strongly leached and are acid, and their content of organic matter and plant nutrients is low. The surface soil is light colored, but the subsoil is red or yellow in places and may be somewhat mottled in the lower part. The subsoil is finer textured and more plastic than the surface soil.

The soils of this group in Clinton County are low in fertility, but they are easy to till. Crops on them respond well if fertilizer is applied.

Red-Yellow Podzolic soils (intergrading to Planosols).—The soils of the Tygart series are the only Red-Yellow Podzolic soils in this county that are intergrading toward Planosols. Tygart soils have general properties that are similar to both of these great soil groups. They have a fine-textured, plastic subsoil, however, and are somewhat poorly drained. The difference in texture between the A horizon of silt loam and the B horizon of silty clay or

clay is marked, but in true Planosols the change in texture is more abrupt.

Sols Bruns Acides.—In this great soil group are soils of the Berks, Chenango, Dekalb, Lehew, and Leck Kill series. Typically, Sols Bruns Acides have a thin A1 horizon and a faint to evident A2 horizon. The B horizon contains little more clay than the horizons that lie above and below and is uniform in color. Sols Bruns Acides are strongly acid and are low in bases.

Typical of this group are the Dekalb soils. These soils have a subsoil that is uniform in texture and color, and they are moderately deep. The Berks, Chenango, Lehew, and Leck Kill soils have characteristics like those of the Dekalb soils, and the Lehew and Leck Kill are similar in depth. The Berks soils, however, are shallow to moderately deep, and the Chenango are deep.

Podzols.—The Leetonia soils are the only Podzols in this county. A typical Podzol has a surface mat of leaf litter; a thin organic-mineral horizon; a gray, leached A2 horizon; a dark-brown B horizon in which organic matter, sesquioxides, or both, have accumulated; and a lighter colored C horizon.

Leetonia soils developed on coarse-grained quartzite and sandstone and are shallow to moderately deep over bedrock. They have a moderately thick organic-mineral A1 horizon covered with leaf litter. It is underlain by a leached A2 horizon that is 4 to 8 inches or more thick and consists of white or gray sand. Below this is 1 to 2 inches of brown loam that, in turn, is underlain by yellowish loamy sand or sandy loam, which makes up the subsoil and substratum.

Low-Humic Gley soils.—The soils in this group are in the Andover, Atkins, Brinkerton, Guthrie, Melvin, Nolo, and Purdy series. Low-Humic Gley soils are poorly drained. They occur in low areas and depressions and are affected by seep water and a high water table. They have a thin surface horizon that generally has a high content of organic matter. The subsoil is distinctly mottled and generally is finer textured and lighter colored than the surface horizon. Of the Low-Humic Gley soils in this county, the Andover, Nolo, and Brinkerton formed in material from acid shale and sandstone, and the Atkins, Melvin, and Purdy formed from alluvium. The Guthrie soils formed in material from limestone and have many properties of Planosols.

Humic Gley soils.—In this county the Lickdale are the only soils in this great soil group. Humic Gley soils have a black or very dark colored surface soil and are very poorly drained. Their subsoil is generally clayey, is strongly mottled, and is gray or bluish gray in color. Water stands at or near the surface of the soils most of the year.

The Lickdale soils are in depressions and other low areas in the mountains of Clinton County. They are very poorly drained, are acid, and have a dark-colored surface soil.

Alluvial soils.—The Barbour, Basher, Huntington, Lindside, Newark, and Pope soils are in this great soil group. Alluvial soils are forming in material that has been deposited recently. The material is on bottom lands of streams and consists of sediments washed from uplands. The soils are young; horizon development is weak or absent because the materials have not been in place long enough for the processes of soil formation to form horizons. The well-drained soils in this group are the Barbour, Huntington, and Pope. The moderately well drained soils are the Basher and Lindside, and the somewhat poorly drained soils are the Newark.

Lithosols (intergrading to Sol Bruns Acides).—In this group are soils of the Klinesville and Montevallo series. Typically, Lithosols are very shallow over bedrock and lack a well-developed soil profile. They generally have a large amount of coarse shale or sandstone fragments throughout the solum and little or no natural horizon development. The soils of the Klinesville and Montevallo series are Lithosols, but they have some characteristics of soils of the Sol Bruns Acides great soil group.

Soil catenas

A catena is a group of soils formed from similar parent material but with unlike soil characteristics because of differences in relief and drainage. It is a practical grouping of soils that are closely associated with each other on the landscape. These soils differ in depth of solum and in natural drainage, but they have many other properties in common. The different soils in the same catena are likely to be present in any one of the areas shown on the general soil map. Table 8 shows the soils of Clinton County grouped into catenas.

Detailed descriptions of soil profiles

In this section the soil series in the county are briefly discussed and a detailed description of a profile that is typical for each series is given. The great soil group is also mentioned for each series, some facts are given about the parent material, and the associated soils are named.

ALBRIGHTS SERIES

In the Albrights series are deep, moderately well drained to somewhat poorly drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in colluvial material derived principally from noncalcareous red shale, siltstone, and sandstone. They are gently sloping to moderately sloping and are on low hillsides and at the base of ridges. Albrights soils are associated with the well-drained Meckesville soils and the moderately deep, well-drained Leck Kill and Lehew. They have a reddish hue, are mottled at a depth between 12 and 36 inches, and have a moderately developed fragipan in the lower part of the subsoil. These soils occupy a small acreage and are not agriculturally important.

Typical profile of Albrights silt loam, 3 to 8 percent slopes, in woodland.

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) silt loam; very weak, fine, granular structure; very friable when moist; many roots; 5 percent coarse fragments; pH 5.0; abrupt, smooth boundary; 1 to 3 inches thick.

A2—2 to 5 inches, brown (7.5YR 5/2) silt loam; weak, very thin, platy structure; friable when moist; many roots; 5 percent coarse fragments; pH 4.6; clear, wavy boundary; 2 to 4 inches thick.

A3—5 to 10 inches, reddish-brown (5YR 4/3) silt loam; weak, medium, platy structure that breaks to weak, coarse, granular; friable when moist, slightly sticky and slightly plastic when wet; many roots; 5 percent coarse fragments; pH 4.8; clear, wavy boundary; 4 to 7 inches thick.

B1—10 to 20 inches, reddish-brown (5YR 4/3) silty clay loam; weak, fine, subangular blocky structure; friable when moist, sticky and plastic when wet; thin, continuous clay films; roots are common; pH 4.8; clear, wavy boundary; 8 to 13 inches thick.

TABLE 8.—*Soil catenas in Clinton County*

Landform and principal kind of parent material	Well drained			Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
	Shallow soils	Moderately deep soils	Deep soils				
Soils on uplands:							
Fairly pure limestone		Hagerstown [1]	Hagerstown	Wiltshire	Guthrie [2]	Guthrie	
Fine-textured, cherty material from gray dolomite.			Hagerstown		Guthrie [2]	Guthrie	
Calcareous, cherty sandstone			Morrison				
Acid red shale	Klinesville	Leck Kill	Upshur	Albrights	Albrights [3]		
Acid gray shale		Gilpin			Cavode		
Gray, coarse-grained sandstone		Leetonia	Leetonia [4]				
Gray sandstone		Dekalb	Hartselle	Cookport	Cookport,[3] Nolo.[2]	Nolo	Lickdale.
Red and reddish-brown sandstone and shale.		Lehew	Ungers				
Thin-bedded, acid shale; soils have a brown subsoil.	Berks [1]	Berks					
Hard, slightly weathered shale	Montevallo						
Glacial till from acid gray sandstone, shale, and quartzite.			Allenwood	Watson		Brinkerton	
Gray or brown, hard shale	Berks [1]	Berks	Hartleton	Comly	Comly [3]	Brinkerton	
Gravelly glacial outwash			Chenango				
Soils on colluvial slopes:							
Colluvium mainly from acid sandstone but that includes some shale; soils have a firm B horizon.			Laidig	Buchanan	Andover,[2] Buchanan.[3]	Andover	
Colluvium from acid gray shale				Leadvale			
Colluvium from acid, reddish-brown sandstone and shale.			Meckesville	Albrights			
Colluvium from shale and sandstone laid down over limestone.			Murrill				
Alluvial and colluvial materials from limestone.			Huntington, local alluvium.	Wiltshire			
Soils on terraces:							
Gray shale and sandstone from slack-water deposits of clay.				Tygart [2]	Tygart	Purdy	Purdy.[5]
Old alluvium from acid red and and gray sandstone and shale.			Sequatchie	Whitwell	Whitwell [3]		
Soils on flood plains:							
Recent alluvium, mostly from limestone	Ashton		Huntington	Lindside	Newark	Melvin	
Alluvium from acid red and gray sandstone and shale.			Barbour	Basher	Atkins,[2] Basher.[3]	Atkins	
Recent alluvium from acid gray sandstone and shale.			Pope		Atkins [2]	Atkins	

[1] Dominantly deep but ranges to moderately deep.
[2] Dominantly poorly drained but ranges to somewhat poorly drained.
[3] Dominantly moderately well drained but ranges to somewhat poorly drained.
[4] Dominantly moderately deep but ranges to deep.
[5] Dominantly poorly drained but ranges to very poorly drained.

B2—20 to 28 inches, reddish-brown (5YR 4/4) silty clay loam; a few, medium, distinct mottles of strong brown (7.5YR 5/6); weak, very coarse, prismatic structure that breaks to moderate, medium, subangular blocky and in places to platy; firm when moist, sticky and plastic when wet; a few roots; moderately thick, continuous clay films; 10 percent coarse fragments; pH 4.8; clear, wavy boundary; 6 to 10 inches thick.

Bx—28 to 39 inches, dark reddish-brown (2.5YR 3/4) gravelly silt loam; common, fine, distinct mottles of strong brown (7.5YR 5/6); weak, very coarse, prismatic structure that breaks to moderate, medium, blocky and in places to platy; firm when moist, sticky and plastic when wet; moderately thick, continuous, reddish-brown (2.5YR 5/4) clay films; 15 percent coarse fragments; pH 5.0; clear, wavy boundary; 9 to 15 inches thick.

C—39 to 45 inches, dusky red (2.5YR 3/2) gravelly sandy loam; massive; firm when moist, nonsticky and nonplastic when wet; pH 5.0.

The color of the subsoil ranges from 7.5YR to 2.5YR in hue. The solum ranges from 2½ to 4 feet in thickness. Depth to mottling ranges from 16 to 30 inches, and depth to hard rock ranges from 4 to 10 feet or more.

ALLENWOOD SERIES

In the Allenwood series are deep, well-drained Red-Yellow Podzolic soils that developed from Illinoian glacial till. The till is composed of gray sandstone, shale, and quartzite. Allenwood soils have a heavier texture, a redder hue, and a thicker B horizon than the Hartleton soils, and

they contain more sandstone and quartzite throughout the profile. They are associated with the moderately well drained Watson soils and the poorly drained Brinkerton. The acreage is small, and the soils are not agriculturally important in this county.

Typical profile of Allenwood gravelly silt loam, 3 to 8 percent slopes, in woodland.

A1—0 to 3 inches, very dark grayish brown (10YR 3/2) gravelly silt loam; moderate, very fine, granular structure; very friable when moist; many shale chips; pH 5.0; abrupt, wavy boundary; 2 to 4 inches thick.

A2—3 to 8 inches, light yellowish-brown (10YR 6/4) gravelly silt loam; weak, medium, granular to weak, fine, subangular blocky structure; very friable when moist; many shale chips; pH 4.8; gradual, wavy boundary; 4 to 7 inches thick.

B1—8 to 15 inches, yellowish-brown (10YR 5/6) gravelly silt loam; moderate, fine, subangular blocky structure that is platy in places; friable when moist, sticky when wet; many shale chips; pH 5.2 abrupt, wavy boundary; 6 to 10 inches thick.

B21—15 to 29 inches, yellowish-red (5YR 5/6) gravelly silty clay loam; moderate, medium, subangular blocky and somewhat platy structure; friable when moist, sticky when wet; many shale chips; pH 5.1; abrupt, wavy boundary; 10 to 16 inches thick.

B22—29 to 42 inches, yellowish-red (5YR 5/8) gravelly silt loam; moderate, thick, platy structure; firm when moist, nonsticky when wet; many shale chips and sandstone fragments; many black coatings; pH 5.1; abrupt, irregular boundary; 10 to 18 inches thick.

C—42 to 48 inches, yellowish-red (5YR 5/8) very gravelly silt loam deposited on shale chips and filling the voids between them.

R—48 inches +, yellow, acid Chemung shale of the Devonian period.

The texture of the surface soil is predominantly gravelly silt loam. The B horizon ranges from silt loam to clay loam in texture. Its hue is typically 5YR. Depth to yellow, acid shale bedrock ranges from 3½ to 5 feet. The content of shale chips varies; it ranges from less than 10 percent to 30 percent or more, by volume. In some places characteristics of these soils are somewhat similar to those of the Hartleton soils.

ANDOVER SERIES

The Andover series consists of poorly drained to somewhat poorly drained Low-Humic Gley soils. These soils developed in deep colluvium that washed or rolled largely from uplands underlain by acid gray sandstone, conglomerate, and quartzite. They are nearly level to moderately sloping and are along the base of ridges and hills where water collects as the result of seepage and the water table is high during most of the year. The amount of coarse fragments is generally large. A distinct fragipan occurs in the B horizon. These soils are relatively low in clay, and the B horizon shows an accumulation of illuvial clay.

Andover soils formed from parent materials similar to that of the well drained Laidig soils, the moderately well drained to somewhat poorly drained Buchanan soils, and the very poorly drained Lickdale. They lack the thick, dark-colored A horizon of the Lickdale soils and are deeper to hard rock than the Cookport. Areas of Andover soils are small and are mainly in the Ridge and Valley section of the county. They are not agriculturally important.

Profile of Andover very stony loam, 0 to 8 percent slopes, in a woodland 5 miles east of Loganton at Carroll on Route 880 (profile S58–PA–18–12(1–5) sampled for laboratory analysis).

A1—0 to 5 inches, very dark brown (10YR 2/2) very stony loam; weak, medium, granular structure; slightly sticky when wet; many angleworm holes; 50 percent stone content; pH 6.8; gradual, wavy boundary; 3 to 6 inches thick.

A2—5 to 8 inches, dark grayish-brown (10YR 4/2) very stony loam; a few, fine, faint mottles; weak, thin to medium, platy structure that breaks to weak, fine, subangular blocky; friable when moist, slightly sticky when wet; many angleworm holes lined with material from the A1 horizon; pH 6.4; abrupt, wavy boundary; 3 to 5 inches thick.

B2—8 to 14 inches, brown (10YR 5/3) very stony loam; many, coarse, prominent mottles of reddish yellow (7.5YR 6/6 to 6/8); moderate, medium, platy structure that breaks to moderate, medium, subangular blocky; friable when moist, sticky when wet; thin, continuous clay films; fine, gravelly and silty lenses; pH 5.9; gradual, irregular boundary; 4 to 10 inches thick.

Bx1—14 to 21 inches, dark grayish-brown (10YR 4/2) very stony fine sandy loam; common, coarse, prominent mottles of light brown (7.5YR 6/4); moderate, medium, platy structure; very firm in place when moist, sticky and plastic when wet; lenses of gravel and sand; moderately thick, continuous clay films; pH 5.7; abrupt, wavy boundary; 4 to 9 inches thick.

Bx2—21 to 45 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; common, coarse, distinct mottles of light brownish gray (10YR 6/2) and light reddish brown (5YR 6/3); moderate, coarse, prismatic structure that breaks to weak, medium, platy; very firm when moist, slightly sticky when wet; pH 6.5.

Profile of Andover very stony loam, 0 to 8 percent slopes, in a pasture in Lamar Township, 1.8 miles east of Rote on Route T353 (profile S58–Pa–18–13(1–6) sampled for laboratory analysis).

Ap—0 to 9 inches, very dark grayish brown (2.5Y 3/2) very stony loam; weak, fine, granular structure; friable when moist; pH 6.5; gradual, irregular boundary; 8 to 12 inches thick.

A2—9 to 14 inches, light yellowish-brown (2.5Y 6/4) very stony loam; weak, fine and medium, blocky structure that in places tends to thin platy; friable when moist, slightly sticky when wet; pH 6.5; clear, wavy boundary; 4 to 7 inches thick.

B21—14 to 18 inches, pale-olive (5Y 6/3) very stony loam; many, medium, prominent mottles of light gray (5Y 7/2) and strong brown (7.5YR 5/6); weak, fine and medium, blocky structure that in places tends to thin platy; friable when moist, slightly sticky when wet; pH 6.6; clear, wavy boundary; 2 to 6 inches thick.

B22—18 to 27 inches, olive-yellow (2.5Y 6/6) very stony clay loam; many, coarse, prominent mottles of light gray (N 7/0) and yellowish brown (10YR 5/6); weak polygons that break to weak, fine, blocky structure and in places to platy; firm when moist, sticky when wet; pH 6.3; abrupt, wavy boundary; 8 to 10 inches thick.

Bx1—27 to 32 inches, light olive-brown (2.5Y 6/4) very stony loam; many, coarse, prominent mottles of gray (N 6/0) and yellowish brown (10YR 5/6); moderate, coarse, prismatic structure that breaks to moderate, medium, blocky and in places to platy; very firm when moist, sticky and slightly plastic when wet; pH 5.9; abrupt, irregular boundary; 4 to 6 inches thick.

Bx2—32 to 38 inches yellowish-brown (10YR 5/6) very stony loam; mainly, medium, prominent mottles of gray (N 6/0); very coarse prismatic structure that in places tends toward thin platy, but massive in the interiors of the peds; very firm when moist, sticky when wet; manganese coats on peds; pH 5.7.

Colors in these soils range from 2.5Y to 7.5R in hue but typically are 10YR. The texture is mostly loam, but it ranges from silt loam to sandy loam. The fragipan is at

a depth of 18 to 30 inches. Coarse fragments range from 10 to 50 percent or more of the material, by volume. The profiles sampled are in areas where seepage collects from limestone areas above. Base status and reaction are considerably higher than are considered typical for the series. The solum ranges from 3 to 6 feet in depth. Depth to hard rock ranges from 4 to 20 feet or more.

ASHTON SERIES

The Ashton series consists of deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Alluvial soils. These soils are on low stream terraces or second bottoms. In some places they developed in alluvium washed mainly from soils derived from limestone that included small amounts of material from other sources. In other places they developed in alluvium washed from soils derived from acid sandstone and shale that periodically received overflow from streams which flowed through areas that were limy. Ashton soils are associated with the Huntington soils, but their horizons are more distinct. The acreage of the Ashton soils is fairly small, but the soils are important to the local agriculture.

Profile of Ashton silt loam in a level and nearly level hayfield in Castanea Township, 1 mile east of Lock Haven on River Road to the airport (profile S58–Pa–18–1(1–8) sampled for laboratory analysis).

Ap—0 to 14 inches, very dark grayish brown (10YR 3/2) silt loam; weak, fine to medium, granular structure; friable when moist; pH 6.6, abrupt, wavy boundary; 13 to 15 inches thick.

B1—14 to 22 inches, dark-brown (7.5YR 4/4) silt loam; very weak prismatic structure that breaks to weak, fine to medium, subangular blocky structure that tends toward prismatic and an indeterminate orientation; friable when moist; pH 7.0; clear, wavy boundary; 7 to 9 inches thick.

B21—22 to 34 inches, reddish-brown (5YR 4/4) silt loam; weak to moderate, medium, subangular blocky structure; friable when moist; pH 6.9; gradual, wavy boundary; 11 to 13 inches thick.

B22—34 to 40 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable when moist; pH 6.6; clear, wavy boundary; 5 to 7 inches thick.

B31—40 to 48 inches, dark-brown (7.5YR 4/4) loam; very weak, medium, subangular blocky structure; friable when moist; pH 6.4; gradual, wavy boundary; 7 to 9 inches thick.

B32—48 to 54 inches, dark-brown (7.5YR 4/4) loam; a few, coarse, faint mottles of gray and strong brown; very weak, medium, subangular blocky structure; friable when moist; partial clay films and in places clay bridging; pH 5.5; clear, wavy boundary; 5 to 7 inches thick.

C1 -54 to 65 inches, dark-brown (7.5YR 4/4) fine sandy loam; massive but a slight indication of layering in places; friable when moist; pH 5.4; clear, wavy boundary; 10 to 12 inches thick.

C2—65 to 72 inches, dark-brown (7.5YR 4/4) fine sandy loam; massive but a slight indication of layering in places; when moist; pH 6.0.

Profile of Ashton silt loam in a field of rotation hay in Dunnstabel Township, 3½ miles east of Lock Haven on old River Road (profile S58–Pa–18–2(1–8) sampled for laboratory analysis.)

Ap—0 to 9 inches, dark-brown (7.5YR 3/2) silt loam; weak, fine, granular structure; friable when moist; pH 5.6; clear, wavy boundary; 8 to 9 inches thick.

B1—9 to 13 inches, reddish-brown (5YR 4/4) silt loam; weak, thin, platy and weak, fine, blocky structure; friable when moist; pH 6.0; gradual, wavy boundary; 3 to 5 inches thick.

B21—13 to 22 inches, yellowish-red (5YR 4/6) light silt loam; weak, fine to medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.3; gradual, wavy boundary; 7 to 10 inches thick.

B22—22 to 30 inches, reddish-brown (5YR 4/4) silt loam; weak, medium to fine, subangular blocky structure; friable when moist; pH 6.0; gradual, wavy boundary; 7 to 9 inches thick.

B23—30 to 39 inches, brown to dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable when moist; pH 5.8; clear, wavy boundary; 8 to 10 inches thick.

B3—39 to 48 inches, reddish-brown (5YR 4/4) to dark-brown (7.5YR 4/4) silt loam; very weak to medium, subangular blocky structure; friable when moist; partial clay films and a few, thin coatings of manganese; pH 5.6; clear, wavy boundary; 8 to 10 inches thick.

C1—48 to 60 inches, dark-brown to brown (7.5YR 4/4) very fine sandy loam; single grain; loose when moist; a few clay bridges and a few manganese films; pH 5.8; gradual, wavy boundary; 11 to 13 inches thick.

C2—60 to 66 inches, brown (10YR 4/3) very fine sandy loam; single grain; friable when moist; pH 5.8.

The soils in some higher areas and in areas along the edges of terraces are coarser textured than the soils in depressions. Depth of the solum ranges from 3 to 5 feet. The sequence of the horizons varies, as does the thickness. The color of the surface soil ranges between hues of 7.5YR and 10YR with a value of 3, and that of the horizons below the surface soil ranges between hues of 5YR and 10YR but typically is 7.5YR. Texture of the surface soil ranges from fine sandy loam to silt loam. The texture of the horizons below the surface soil ranges from loamy sand in the lower B and C horizons to light silty clay in the upper B horizon. Reaction of the surface soil ranges from pH 5.5 to 7.5, depending upon liming practices. Below this layer, pH ranges from 5.8 to 6.5. In places weak, fine, faint mottles occur at a depth below 40 inches. The thickness of the surface soil ranges from 9 to 15 inches, and this thickness is partly the result of fresh deposits of soil material from infrequent flooding.

ATKINS SERIES

In the Atkins series are poorly drained to somewhat poorly drained Low-Humic Gley soils. These soils developed in alluvium washed largely from acid sandstone and shale. They are similar to the Melvin soils but are more acid throughout the profile. Atkins soils are associated with the well drained Pope soils and the moderately well drained to somewhat poorly drained Philo. The areas are small, and these soils are not agriculturally important in the county.

Typical profile of Atkins silt loam in a level and nearly level area of woodland.

A1—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thick, platy structure that breaks to weak, medium, granular; very friable when moist; pH 5.6; clear, wavy boundary; 8 to 11 inches thick.

ACg—9 to 14 inches, grayish-brown (10YR 5/2) silt loam; a few, fine, faint mottles of yellowish brown (10YR 5/4); weak, thick, platy structure that breaks to moderate, coarse, granular; very friable when moist; pH 5.4; abrupt, wavy boundary; 4 to 7 inches thick.

C1g—14 to 34 inches, olive-gray (5Y 5/2) silt loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); weak, medium, platy structure that breaks to weak, fine, subangular blocky; friable when moist, slightly sticky and slightly plastic when wet; pH 5.4; gradual, wavy boundary; 18 to 22 inches thick.

C2g—34 to 48 inches, gray (5Y 5/1) silty clay loam; many, fine, prominent mottles of strong brown (7.5YR 5/6); massive; friable when moist, sticky and plastic when wet; black films on peds; pH 5.2.
IIC—48 to 72 inches, gravel and sand.

The texture of these soils ranges from silt loam to silty clay loam, but silt loam is most common. In small areas along the smaller streams in sections of the county underlain mainly by sandstone, the texture is loam and sandy loam and the soils are stony. Depth to mottling in the Atkins soils ranges from 0 to 10 inches. The mottles range from a few, fine, faint to many, common, distinct. Their color ranges from strong brown or pale brown to yellow and gray. Reaction of these soils ranges from pH 5.0 to 5.6. In places the C horizon is stratified. Small pockets of sand or gravel are common in these soils, and there are iron concretions in the lower part of the C2g horizon.

BARBOUR SERIES

In the Barbour series are deep, well-drained, level and nearly level Alluvial soils developed in alluvium washed largely from red and gray acid sandstone and shale. These soils are associated with the moderately well drained to somewhat poorly drained Basher soils and the poorly drained to somewhat poorly drained Atkins. The acreage is small, and the soils have slight to moderate agricultural importance.

Typical profile of Barbour fine sandy loam in a level and nearly level, cultivated field.

Ap—0 to 9 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine to medium, granular structure that breaks to moderate, medium, granular; friable when moist; many plant roots; pH 6.6; abrupt, wavy boundary; 8 to 10 inches thick.
AC—9 to 13 inches, yellowish-red (5YR 4/6) fine sandy loam; weak, medium, platy structure; friable when moist; many plant roots; pH 6.0; clear, wavy boundary; 3 to 6 inches thick.
C1—13 to 23 inches, reddish-brown (5YR 4/4) sandy loam; moderate, medium, prismatic structure that breaks to moderate, medium, platy; slightly firm when moist; in places contains small pebbles; pH 5.2; clear, wavy boundary; 8 to 12 inches thick.
IIC2—23 to 36 inches, yellowish-red (5YR 4/6) sandy loam; structureless; moderately firm when moist; black films in places; pH 5.2; gradual, wavy boundary: 11 to 15 inches thick.
IIC3—36 to 48 inches, reddish-brown (5YR 4/4) sandy loam to loamy sand; loose when moist; pH 5.0.
IIIC—48 inches, gravel.

The texture of these soils is generally sandy loam, loam, or silt loam. The color ranges from 2.5YR to 7.5YR in hue but typically is 5YR. Texture of the C horizon ranges from sandy loam to sandy clay loam or heavy silty clay loam. The content of gravel varies. Reaction of the lower part of the C horizon is very strongly acid to medium acid, and the pH ranges from 4.8 to 5.8. The reaction of the surface soil and the upper part of the C horizon depends upon the liming practices used. Depth to gravel ranges from 30 to 120 inches or more.

BASHER SERIES

The Basher series consists of deep, moderately well drained to somewhat poorly drained Alluvial soils that developed in material washed from areas of mixed red and gray sandstone and shale. They are on the first terrace of flood plains and are flooded frequently. Basher soils differ from the Lindside soils in being very acid to acid rather than slightly acid to neutral. They are associated with the well-drained Barbour soils and the poorly drained Atkins. The acreage of these soils is small, and the soils are not agriculturally important.

Typical profile of Basher silt loam in a cultivated field.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky when wet; pH 6.4; abrupt, smooth boundary; 7 to 9 inches thick.
AC—8 to 16 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine to medium, granular structure; friable when moist, sticky and slightly plastic when wet; pH 5.8; gradual, wavy boundary; 8 to 11 inches thick.
C1—16 to 22 inches, reddish-brown (5YR 4/4) silt loam; common, fine, faint mottles of brown (7.5YR 5/3) and dark reddish brown (5YR 3/2); weak, fine, prismatic structure that breaks to weak, fine, subangular blocky; slightly firm when moist, slightly sticky and slightly plastic when wet; dark films and clay balls in places; pH 5.2; gradual, wavy boundary; 5 to 9 inches thick.
C2—22 to 35 inches, reddish-brown (5YR 5/4) silt loam; many, medium, distinct mottles of brown (7.5YR 5/2) and dark reddish brown (5YR 3/2); weak, medium, prismatic structure that breaks to weak, fine, subangular blocky; slightly firm when moist, slightly sticky and slightly plastic when wet; clay balls in places; pH 5.0; gradual, wavy boundary; 11 to 15 inches thick.
C3—35 to 48 inches +, reddish-brown (5YR 5/4) silt loam; many, medium to coarse, distinct mottles of pinkish gray (7.5YR 6/2), strong brown (7.5YR 5/8), and dark reddish brown (5YR 2/2); friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; pH 5.0.

The texture of the surface soil is silt loam, fine sandy loam, gravelly sandy loam, or light silty clay loam, and that of the subsoil is silt loam, fine sandy loam, sandy loam, loamy fine sand, or sandy clay loam. There is stratification in the lower part of the C horizon in places. The strata are gravelly or sandy in places and contain a few boulders. The color of these soils ranges between 7.5YR and 10YR in hue. Reaction ranges from pH 4.6 to 5.4. Depth to mottling ranges from 14 to 24 inches, and depth to gravel ranges from 36 to 48 inches.

BERKS SERIES

In the Berks series are moderately deep to shallow, well-drained Sols Bruns Acides. These soils developed in material weathered from acid gray and yellow shale, siltstone, and fine-grained sandstone. They have large amounts of coarse fragments throughout the solum and little evidence of alluvial clay in the B horizon.

Berks soils are associated with the deep, well drained Hartleton soils, the moderately well drained Comly soils, and the poorly drained Brinkerton. Areas of Berks soils on the Allegheny Plateau escarpment north of the Susquehanna River to Lock Haven and Bald Eagle Creek are fairly large. The soils are of moderate agricultural importance.

Typical profile of Berks channery silt loam, 15 to 25 percent slopes, in woodland.

A1—0 to 2 inches, very dark brown (10YR 2/2) channery silt loam; weak, very fine to fine, granular structure; very friable when moist; a few, fine, hard shale chips and a few, hard channery fragments; has a high content of organic matter; strongly acid, pH 4.8–5.0; abrupt, smooth boundary; 1 to 3 inches thick.
A2—2 to 10 inches, pale-brown (10YR 6/3) and very pale brown (10YR 7/3) shaly silt loam; very weak, thin, platy and granular structure; very friable when

moist; many, fine, hard shale chips and in places channery fragments; pH 5.2; gradual, wavy boundary; 5 to 7 inches thick.

B2—10 to 23 inches, brown (10YR 5/3) and pale-brown (10YR 6/3) shaly silt loam; fine and medium, subangular blocky structure; friable when moist; many, fine, hard chips and fragments of shale; pH 5.2; gradual, wavy boundary; 9 to 14 inches thick.

C—23 inches +, loose, shattered siltstone and hard shale fragments that are channery, flaggy, and stony; in places the fragments have silt coatings on them that are brown (10YR 4/2) to dark grayish brown (10YR 4/3); the material grades to hard, moderately thick bedded shale at a depth of 25 to 36 inches; the shale weathers to hard fragments that are channery and flaggy and are ½ to 1 inch thick.

The content of coarse fragments varies greatly from place to place. Depth of the solum ranges from 10 to 30 inches but typically is 22 to 26 inches, and it is thickest near the base of slopes. The shaly soils generally have a thinner solum than the channery soils. In many places the shaly soils developed on nearly neutral or slightly calcareous shale. Here the reaction in the C horizon is higher than in Berks soils that formed in material from noncalcareous shale.

BRINKERTON SERIES

In the Brinkerton series are poorly drained Low-Humic Gley soils. These soils developed in a mixture of material from gray shale, siltstone, and sandstone, generally in glacial till or in periglacial and colluvial deposits. They are nearly level to gently sloping and occupy areas where the water table is near the surface and the soil is saturated during winter and spring. The solum is generally more than 30 inches thick and has a moderately expressed fragipan. The subsoil is gleyed and shows evidence of accumulation of illuvial clay.

Brinkerton soils are associated with the well drained Allenwood soils, the moderately well drained Watson soils, and the very poorly drained Lickdale. They are more silty and less sandy than the Andover soils and have a less strongly expressed fragipan. The acreage of Brinkerton soils is small, and most areas are in pasture and woodland.

Typical profile of Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded, in a pasture.

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; weak, fine to medium, subangular blocky structure; friable when moist; contains 5 percent of sandstone, quartzite, and shale fragments; many roots; pH 5.6; abrupt, smooth boundary; 7 to 9 inches thick.

B2g—9 to 20 inches, light brownish-gray (10YR 6/2) clay loam; many, coarse, distinct mottles of light gray (10YR 7/1 to 7/2) and yellowish brown (10YR 5/6); strong, coarse to very coarse, prismatic structure that breaks to moderate, thin to medium, platy; hard when dry, firm when moist, sticky and plastic when wet; clay films are thick and continuous; gray clay on polygon faces; roots present to a depth of 12 inches; 5 to 10 percent sandstone, quartzite, and shale fragments; pH 4.4; clear, wavy boundary; 9 to 14 inches thick.

Bx—20 to 36 inches, strong-brown (7.5YR 5/6) and light reddish-brown (5YR 6/4) sandy clay; many, coarse, distinct mottles of gray (N 5/0) and specks of red (2.5YR 4/6); strong, very coarse, prismatic structure that breaks to strong, very thick, platy; very hard when dry, very firm when moist, and sticky when wet; clay films are thick and continuous; gray silt and clay on polygon faces; 15 percent sandstone, quartzite, and shale fragments; pH 4.6.

R—36 inches +, red, thin-bedded shale.

The texture of the surface soil is generally silt loam, but it ranges to shaly and gravelly silt loam and loam. In color the surface soil ranges from 2.5Y to 7.5YR in hue. The content of coarse fragments ranges from less than 5 percent, by volume, to 30 percent or more in the lower part of the solum. Depth to the fragipan ranges from about 18 to 25 inches. The solum ranges from 30 to 60 inches in depth. Depth to hard rock ranges from 2½ to 10 feet or more. If the soils have not been limed, reaction ranges from very strongly acid to strongly acid.

BUCHANAN SERIES

In the Buchanan series are deep, moderately well drained to somewhat poorly drained Red-Yellow Podzolic soils. These soils developed in material weathered mainly from acid, gray, medium- to coarse-grained sandstone and siltstone but partly from shale. They are at the base of slopes where colluvium has collected. Buchanan soils are not so fine textured as the Watson soils, and they have a more distinct fragipan. They are associated with the well-drained Laidig soils, the somewhat poorly drained to poorly drained Andover soils, and very poorly drained Lickdale. The acreage of the Buchanan soils is fairly small, and the areas are only on colluvial slopes in valleys in the Ridge and Valley province. The soils have slight agricultural importance.

Profile of Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded, in a pasture in Greene Township, 1.5 miles east of Carroll on Route 880 (profile S58–Pa–18–11 (1–7) sampled for laboratory analysis).

Ap—0 to 12 inches, dark-brown (10YR 4/3) gravelly loam; weak, fine, granular structure; friable when moist; pH 6.4; abrupt, irregular boundary; 10 to 16 inches thick.

B1—12 to 17 inches, yellowish-brown (10YR 5/6) gravelly loam; weak, fine to medium, subangular blocky structure; friable when moist; pH 6.4; clear, wavy boundary; 3 to 7 inches thick.

B21—17 to 21 inches, yellowish-brown (10YR 5/6) gravelly loam; weak to moderate, fine, subangular blocky structure; friable when moist; a few manganese films; pH 6.5; abrupt, wavy boundary; 3 to 6 inches thick.

B22—21 to 27 inches, yellowish-brown (10YR 5/6) gravelly loam; common, fine, distinct mottles of light yellowish brown (2.5Y 6/4); weak, medium, platy structure that breaks to moderate, fine, blocky; friable to firm when moist; common manganese coats; pH 6.0; abrupt, wavy boundary; 4 to 8 inches thick.

Bx1—27 to 32 inches, yellowish-brown (10YR 5/8) gravelly loam; many, medium, prominent mottles of pale yellow (5Y 7/3); weak, coarse, prismatic and medium, platy structure that breaks to weak, fine, blocky in the interior of the peds; hard when dry, very firm when moist; common manganese films; pH 5.3; clear, wavy boundary; 3 to 7 inches thick.

Bx2—32 to 41 inches, yellowish-brown (10YR 5/4) gravelly loam; common, coarse, prominent mottles of light gray (5Y 7/2); weak, very coarse, prismatic structure to thick, platy; firm when moist, slightly plastic when wet; common manganese films and concretions; pH 5.3; clear, wavy boundary; 7 to 11 inches thick.

Bx3—41 to 57 inches, yellowish-brown (10YR 5/4) gravelly loam that breaks to polygons that are 6 to 8 inches in diameter; firm when moist; common manganese films; pH 5.2.

Profile of Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded, in a hayfield in Lamar Township, 0.9

mile east of Rote on Route T353 and 4.0 miles southeast of Mill Hall (profile S58–Pa–18–15(1–8) sampled for laboratory analysis).

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) gravelly loam; weak, fine, granular structure that is platy in places; friable when moist; pH 7.2; abrupt, smooth boundary; 6 to 8 inches thick.

A2—7 to 9 inches, yellowish-brown (10YR 5/6) gravelly loam; moderate, fine and medium, platy structure; friable when moist; pH 7.1; clear, wavy boundary; 1 to 4 inches thick.

B1—9 to 14 inches, yellowish-brown (10YR 5/6) gravelly clay loam; weak, fine and medium, subangular blocky structure; friable when moist, slightly plastic and slightly sticky when wet; thin, pitted, discontinuous clay films; pH 6.8; clear, wavy boundary; 3 to 7 inches thick.

B21—14 to 20 inches, yellowish-brown (10YR 5/4) gravelly clay loam that in places contains specks of dark brown (10YR 3/3); moderate, medium, subangular blocky structure; friable when moist, slightly plastic and slightly sticky when wet; thin, discontinuous clay films; pH 6.2; clear, irregular boundary; 3 to 9 inches thick.

B22—20 to 26 inches, yellowish-brown (10YR 5/4) very gravelly clay loam; many, fine, distinct mottles of gray (N 6/0) and dark yellowish brown (10YR 3/4); moderate, medium, blocky structure; friable to firm when moist, slightly plastic and slightly sticky when wet; thin clay films on tops of polygons in this horizon; pH 5.6; gradual, irregular boundary; 3 to 9 inches thick.

Bx1—26 to 31 inches, dark-brown (7.5YR 4/4) very gravelly clay loam; many, medium, distinct mottles of gray (N 6/0) and pale yellow (2.5Y 7/4); moderate, coarse, prismatic structure that breaks to moderate, fine to medium, blocky; firm in place, slightly plastic and sticky when wet; thin clay films; black concretions and coatings in places; pH 5.4; abrupt boundary; 0 to 8 inches thick.

Bx2—31 to 38 inches, yellowish-brown (10YR 5/4) very gravelly loam; common, coarse to medium, distinct mottles of dark yellowish brown (10YR 3/4) and light gray (2.5Y 7/2); moderate, coarse, prismatic structure that breaks to moderate, medium, blocky and in places is platy; firm in place, nonplastic and sticky when wet; partial clay films; many black coatings and concretions; pH 5.3; clear, irregular boundary; 4 to 10 inches thick.

Bx3—38 to 47 inches, dark-brown (10YR 3/4) very gravelly loam; a few, fine, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); weak, coarse, prismatic structure that breaks to weak, thin, platy; firm in place, nonplastic and slightly sticky when wet; a few clay films; many, fine, black concretions; pH 5.3.

The A horizon is typically 10YR in hue, but the hue ranges to 7.5YR. The texture of the B horizon ranges from loam to clay loam. Coarse fragments in these soils range from a few to many. The fragipan ranges from firm to very firm, and depth to the fragipan ranges from 24 to 36 inches. Depth of the solum ranges from 2½ to 5 feet. The underlying sandstone is dominantly gray, but in places it is red.

CAVODE SERIES

In the Cavode series are somewhat poorly drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. The soils developed on interbedded clay shale and gray sandstone in which clay shale is dominant. They are in the unglaciated part of the Allegheny Plateau, which includes the area of Clinton County north of the Allegheny escarpment. Cavode soils are similar to the Nolo soils but are heavier textured and are somewhat better drained. They are associated with the Gilpin, Hartsells, Dekalb, and Cookport soils. The acreage of Cavode soils in this county is small, and the soils are not agriculturally important.

Typical profile of Cavode silt loam, 3 to 8 percent slopes, in an idle field.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak to moderate, medium, granular structure; friable when moist; pH 6.6; abrupt, wavy boundary; 7 to 9 inches thick.

B1—8 to 13 inches, brown (7.5YR 4/4) silty clay loam; weak, very thick, platy structure that breaks to moderate, medium, subangular blocky; brown (7.5YR 5/4), thin, continuous clay films on peds; friable when moist, sticky and plastic when wet; pH 5.8; clear, wavy boundary; 4 to 7 inches thick.

B21—13 to 17 inches, brown (7.5YR 4/4) silty clay loam; common, medium, faint and distinct mottles of strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure and moderate, thick, brown (7.5YR 5/4) clay films on the peds; slightly firm when moist, sticky and plastic when wet; pH 5.4; abrupt, wavy boundary; 4 to 6 inches thick.

B22—17 to 24 inches, strong-brown (7.5YR 5/8) silty clay loam; many, coarse, prominent mottles of gray (5Y 6/1) and a few spots of dusky red (2.5YR 3/2); moderate, coarse, blocky and subangular blocky structure and thick, continuous clay films of reddish gray (5YR 5/2) and light brownish gray (2.5Y 6/2); slightly firm when moist, sticky and plastic when wet; a few roots along the faces of the peds; pH 4.8; abrupt, wavy boundary; 6 to 8 inches thick.

B23—24 to 28 inches, yellowish-brown (10YR 5/6) silty clay loam; many, fine to medium, prominent mottles of dark reddish-brown (2.5YR 2/4), strong brown (7.5YR 5/8), and gray (5Y 6/1); moderate, medium, subangular blocky structure; slightly firm when moist, sticky and plastic when wet; thin, discontinuous clay films; 2 percent coarse fragments; pH 4.8; abrupt, wavy boundary; 3 to 5 inches thick.

B24—28 to 36 inches, yellowish-brown (10YR 5/6) silty clay loam; many, medium, prominent mottles of gray (N 6/0) and pinkish gray (5YR 6/2); weak, medium, prismatic structure; slightly firm when moist, sticky and plastic when wet; thin clay films on vertical faces; 20 percent coarse fragments of sandstone and rotten shale; pH 4.8.

B3—36 to 48 inches, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silt loam with ped coatings of light gray (10YR 7/1) and streaks of strong brown (7.5YR 5/6); weak, coarse polygons; slightly firm to firm when moist; 40 percent coarse sandstone fragments; pH 4.8.

C—48 to 52 inches +, brown (10YR 4/3) very shaly silt loam; massive; 70 percent coarse fragments.

The texture of the surface soil ranges from silt loam to silty clay loam, depending on the land use and the parent material. In the horizons below the surface soil, the texture ranges from silt loam to silty clay. Typically, the color of the surface soil is 10YR in hue, and variation either way is slight. In the horizons below the surface soil, the color of the matrix typically ranges between 7.5YR and 10YR in hue. The color of the mottles ranges from 2.5YR to 2.5Y in hue. The content of stone in the lower part of the B horizon ranges from less than 1 percent to as much as 40 percent. The content of red shale in these soils ranges from 0 to 2 percent. Depth of the solum ranges from 42 to 72 inches.

CHENANGO SERIES

The Chenango series consists of deep, well-drained Sols Bruns Acides that developed in noncalcareous glacial outwash made up of stratified sand and gravel. The Che-

nango soils are the only ones in Clinton County that formed in this kind of parent material. These soils have a weakly developed textural B horizon. They are in areas above the normal flood plain and typically have an irregular, rolling, and broken topography. The acreage of these soils is small.

Typical profile of a Chenango gravelly loam in a cultivated field.

Ap—0 to 8 inches, dark-brown (10YR 3/3) gravelly loam; 20 percent of layer is gravel; weak, very fine, granular and weak, thin, platy structure; friable when moist, nonsticky and nonplastic when wet; pH 7.0; abrupt, wavy boundary; 6 to 10 inches thick.

B21—8 to 11 inches, dark yellowish-brown (10YR 4/4) gravelly loam that is 25 percent gravel; weak, thin, platy structure; friable when moist, nonsticky and nonplastic when wet; pH 6.9; clear, wavy boundary; 2 to 5 inches thick.

B22—11 to 24 inches, dark-brown (7.5YR 4/4) gravelly loam that is 40 percent gravel; weak, medium, subangular blocky structure; friable when moist, nonsticky and nonplastic when wet; pH 6.9; abrupt, irregular boundary; 10 to 26 inches thick.

IIB3—24 to 37 inches, reddish-brown (5YR 4/3) very gravelly loamy coarse sand, 85 percent of which is gravel that averages 5 inches in diameter; structure is obscured by gravel; the pieces of gravel have thick silt films and coats on their upper surface; friable when moist, nonsticky and nonplastic when wet; pH 6.9; gradual, wavy boundary; 10 to 16 inches thick.

IIC—37 to 48 inches +, dark-brown (7.5YR 4/2) very gravelly loamy coarse sand, 75 percent of which is gravel that averages 11 inches in diameter; moderately thick silt and clay films are on the upper surface of the pieces of gravel; iron and manganese deposits are on the bottom surface; structure is obscured by gravel; friable when moist, nonsticky and nonplastic when wet; pH 6.8; 9 or more inches thick.

The texture of the surface soil is gravelly sandy loam, gravelly loam, or silt loam, and that of the subsoil is gravelly loam or gravelly sandy loam. The color of the surface soil is generally 10YR in hue, and the color of the subsoil ranges between 10YR and 7.5YR in hue. The content of gravel in the soils ranges from 20 to 90 percent, and the gravel is from gray and red sandstone and shale. Depth of the silty material over stratified sand and gravel ranges from 12 to 48 inches and averages 24 inches.

COMLY SERIES

In the Comly series are deep, moderately well drained to somewhat poorly drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils have a fragipan that is weakly to moderately expressed. They developed on glacial till derived mostly from dark-gray or brown, moderately hard shale. Comly soils have more silt and less sand than the Watson soils. Also, their subsoil is lighter colored and their fragipan is less distinct. The Comly soils are associated with the shallow, Montevallo soils, the moderately deep Hartleton soils, and the deep Allenwood soils, which are all well drained. They are also associated with the poorly drained Brinkerton soils. Comly soils are of slight agricultural importance in Clinton County.

Typical profile of Comly silt loam, 3 to 8 percent slopes, moderately eroded, in a cultivated field.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist; contains many roots; pH 7.0; abrupt, wavy boundary; 8 to 11 inches thick.

B21—9 to 19 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, fine to medium, subangular blocky structure; friable when moist; contains a few roots and shale chips; pH 6.4; clear, wavy boundary; 8 to 11 inches thick.

B22—19 to 26 inches, light brownish-gray (10YR 6/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8) and light gray (10 YR 7/2); weak, coarse, prismatic structure that breaks to moderate, fine to medium, blocky; firm when moist, slightly sticky when wet; thin, continuous clay films; a few roots; common shale chips and pieces of fine sandstone; clear, irregular boundary; pH 5.8; 6 to 12 inches thick.

Bx—26 to 38 inches, yellowish-brown (10YR 5/4) silt loam; many, fine, distinct mottles of yellowish brown and very pale brown (10YR 7/3); moderate, coarse, prismatic structure that breaks to weak, fine, blocky and in places is platy; firm consistence when moist; very thin, faint clay films; 30 percent shale fragments; clear, wavy boundary; contains a few small sandstone fragments; 4 to 8 inches thick.

C—38 to 50 inches, strong-brown (7.5YR 5/6) loam that contains many shale fragments and in places sandstone fragments; no clay films.

The texture of the surface soil is silt loam or shaly silt loam, and that of the subsoil is silty clay loam or silty clay. Fine shale fragments and small sandstone fragments range from less than 5 percent, by volume, in the upper part of the solum to 40 percent or more in the lower part of the B horizon. Depth of the solum ranges from 2 to 4 feet. Depth to the fragipan ranges from 16 to 26 inches, and depth to bedrock ranges from 3 to 5 feet.

COOKPORT SERIES

The Cookport series consists of moderately deep to deep, moderately well drained to somewhat poorly drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in material weathered mostly from sandstone but partly from siltstone and shale. They are nearly level to moderately sloping and have a distinct fragipan in the B horizon.

Cookport soils commonly are near or adjacent to the well-drained Hartsells, Dekalb, and Leetonia soils, which do not have a fragipan. They are also near or adjacent to the poorly drained Nolo soils, which are more gray and less brown in the upper part of the solum than Cookport soils. The acreage of the Cookport soils in Clinton County is moderate and most of it is in woodland.

Typical profile of Cookport loam, 3 to 8 percent slopes, in woodland.

A1—0 to 1 inch, black (10YR 2/1) loam; weak, fine, granular structure; loose to very friable when moist; pH 4.6; abrupt, wavy boundary; ½ to 2 inches thick.

A2—1 inch to 3 inches, light brownish-gray (10YR 6/2) loam; weak, thin, platy structure that breaks to weak, fine, granular; very friable when moist; many sandstone fragments; pH 5.0; abrupt, irregular boundary; 1 to 4 inches thick.

A3—3 to 8 inches, yellowish-brown (10YR 5/4) loam; weak, thin, platy structure; very friable when moist; pH 5.0; clear, wavy boundary; 2 to 5 inches thick.

B21—8 to 14 inches, yellowish-brown (10YR 5/6) gravelly clay loam; weak, thick, platy structure that breaks to weak, fine, subangular blocky; friable when moist; thin, discontinuous clay films; pH 5.2; clear, wavy boundary; 5 to 8 inches thick.

B22—14 to 22 inches, yellowish-brown (10YR 5/6) gravelly clay loam; weak, medium, prismatic structure that breaks to weak, fine to medium, blocky; friable when moist; thin, continuous clay films; pH 5.2; clear, wavy boundary; 7 to 10 inches thick.

Bx—22 to 34 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; many, fine, distinct mottles of yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2); weak, fine, prismatic structure that breaks to weak, thin, platy; very firm in place; clay coats are thick and discontinuous and have bridging in places; pH 5.2; 12 to 18 inches thick.

C—34 to 40 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; massive; firm when moist; a few black films; no mottles; many stone fragments; pH 5.2.

R—40 inches +, acid gray sandstone.

The texture of the surface soil is sandy loam, very stony sandy loam, or silt loam. In areas where the amount of shale in the parent material is large, the horizons below the surface soil range in texture to as fine as silty clay loam in a few places. In places fragments of channery and flaggy sandstone and shale occur throughout the profile. The color of these soils typically is 10YR in hue, and the chroma is low and seldom exceeds 4. In many places the hue is 7.5YR and in a few places it is 2.5Y. Generally, the fragipan is at a depth of about 20 inches, but depth to the fragipan ranges from 16 to 24 inches. Mottles range from a few, fine, faint to common, medium, distinct. The fragipan ranges from firm to extremely firm in a few places. The number of stones in the soils ranges from almost none to enough that they make tillage of intertilled crops impractical.

DEKALB SERIES

In the Dekalb series are moderately deep, well-drained Sols Bruns Acides that developed in material weathered mainly from gray, acid sandstone but partly from shale. These soils are in both the Ridge and Valley province and the Allegheny Plateau part of the county. The areas are generally at elevations of more than 1,200 feet, and the soils are underlain by several different geologic formations.

Dekalb soils have a gray, strongly leached A2 horizon that is seldom more than 2 inches thick. They are similar to the Leetonia soils but lack the thick Bir horizon of those soils. These soils are associated with the deep, well-drained Hartsells soils and the moderately well drained to somewhat poorly drained Cookport. They are also associated with the somewhat poorly drained to poorly drained Nolo soils and the very poorly drained Lickdale. Dekalb soils are widely distributed throughout the county. The acreage is large but little is cultivated. The soils are used mainly for forest.

Profile of Dekalb very stony sandy loam, 8 to 25 percent slopes, in woodland in Lamar Township, 1.2 miles southwest of the Riansares Fire Tower on a forest road (profile S58–Pa–18–4(1–6) sampled for laboratory analysis).

O1—A thin cover of litter made up mainly of undecomposed chestnut oak, black oak, and blueberry leaves.

O2—1 inch or less of black (N 2/0) leaf mold, roots, and mycelia.

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) very stony sandy loam; weak, very fine, granular structure; very friable when moist; many tree roots; pH 4.8; abrupt, wavy boundary; 0 to 4 inches thick.

A21—2 to 3 inches, gray (10YR 5/1) very stony fine sandy loam; single grain; very friable to loose when moist; discontinuous trace of a Bir horizon occurs below this layer; pH 4.8; abrupt, irregular boundary; 0 to 3 inches thick.

A22—3 to 10 inches, yellowish-brown (10YR 5/6) very stony fine sandy loam; weak, thin, platy structure that breaks to fine, medium, granular; friable when moist; pH 5.0; gradual, wavy boundary; 5 to 8 inches thick.

B21—10 to 21 inches, yellowish-brown (10YR 5/6) very stony fine sandy loam; weak, medium, subangular blocky structure that is platy in places; friable when moist; pH 4.9; abrupt, wavy boundary; 10 to 12 inches thick.

B22—21 to 35 inches, yellowish-brown (10YR 5/6) very stony fine sandy loam; weak, medium, subanglar blocky structure; friable when moist but is more firm toward the bottom of this horizon; this horizon is sandier where it is in contact with sandstone rocks; pH 4.8; abrupt, wavy boundary; 12 to 15 inches thick.

C—35 to 52 inches, yellowish-brown (10YR 5/4) very stony fine sandy loam; massive; friable when moist; pH 5.2.

Profile of Dekalb very stony sandy loam, 25 to 100 percent slopes, in woodland in Crawford Township, 2 miles east of McElhattan on Route 18013 (profile S58–Pa–18–5(1–6) sampled for laboratory analysis).

O1—2 inches to 1 inch of hardwood litter that consists mainly of undecomposed chestnut oak, black oak, and blueberry leaves.

O2—1 inch or less of black (N 2/0) leaf mold that contains many tree roots and fungus mycelia; pH 4.3; abrupt wavy boundary.

A2—0 to 2 inches, very dark gray (10YR 3/1) very stony sandy loam; single grain; friable when moist, nonsticky when wet; a trace of organic staining occurs immediately beneath this layer; pH 3.9; abrupt, wavy boundary; 0 to 2½ inches thick.

A3—2 to 7 inches, yellowish-brown (10YR 5/4) very stony sandy loam; weak, fine, granular structure; friable when moist; pH 4.8; clear, wavy boundary; 3 to 7 inches thick.

B21—7 to 16 inches, yellowish-brown (10YR 5/4) to pale yellowish-brown (10YR 6/4) sandy loam; weak, medium, subangular blocky structure; friable when moist; pH 4.9; clear, wavy boundary; 8 to 10 inches thick.

B22—16 to 28 inches, yellowish-brown (10YR 5/4) sandy loam; weak, medium to coarse, subangular blocky structure; friable when moist; pH 5.0; gradual, wavy boundary; 9 to 14 inches thick.

C1—28 to 38 inches, brown (10YR 5/3) sandy loam; single grain; very friable when moist; pH 5.2.

Profile of Dekalb very stony sandy loam, 15 to 25 percent slopes, in woodland in Colebrook Township, 2 miles north of Farrandsville on Hazard Road in State Game Lands No. 89 (profile S58–Pa–18–6(1–6) sampled for laboratory analysis):

O1—1 inch or less of undecomposed leaves from scrub oak, white oak, maple, pitch pine, mountain-laurel, blueberry, and sweetfern.

A1—0 to 2 inches, black (N 2/0) very stony sandy loam; weak, fine, granular structure; friable when moist; pH 4.5; abrupt, wavy boundary; 1 to 3 inches thick.

A21—discontinuous and too thin for characterization.

Bir—discontinuous and too thin for characterization.

A22—2 to 7 inches, light yellowish-brown (10YR 6/4) very stony sandy loam; weak, fine, granular structure; friable when moist; slightly sticky when wet; pH 5.0; clear wavy boundary; 4 to 7 inches thick.

B1—7 to 11 inches, pale-brown (10YR 6/3) very stony sandy loam; weak, medium to coarse, granular structure that is slightly platy in places; friable when moist; pH 4.9; abrupt, wavy boundary; 3 to 4 inches thick.

B2—11 to 20 inches, yellowish-brown (10YR 5/4) very stony sandy loam; weak, medium to coarse, subangular blocky structure; friable when moist, slightly sticky when wet; patches of thin clay films on peds; pH 5.0; clear, wavy boundary; 8 to 11 inches thick.

B3—20 to 29 inches, yellowish-brown (10YR 5/4) very stony sandy loam; weak, coarse, subangular blocky structure; friable when moist; pH 5.2; clear, wavy, boundary; 6 to 12 inches thick.

C—29 to 34 inches, yellowish-brown (10YR 5/4) very stony sandy loam; massive; friable when moist, slightly stick when wet; a few roots; pH5.3.

Profile of Dekalb very stony sandy loam, 25 to 100 percent slopes (in mapping unit Dekalb very stony soils, 25 to 100 percent slopes) in woodland in Bald Eagle Township, 7.5 miles north of Lock Haven on Eagleton Field Road (profile S58–Pa–18–7(1–6) sampled for laboratory analysis).

O1—Thin cover of hardwood litter made up of undecomposed leaves from red oak, white oak, red maple, aspen, mountain-laurel, and blueberry.
O2—1 inch or less of black (N 2/0) decomposed leaf litter, fine roots, and fungus mycelia; pH 4.8.
A2—Thin, discontinuous gray layer.
Bir—0 to 2 inches, dark-brown (7.5YR 4/4) very stony sandy loam; massive; friable when moist; pH 4.8; clear, wavy boundary; 1 to 3 inches thick.
A'2—2 to 8 inches, brownish-yellow (10YR 6/6) very stony sandy loam; weak, medium, platy structure that breaks to weak, fine, subangular blocky; friable when moist, slightly sticky when wet; pH 5.0; abrupt, wavy boundary; 5 to 7 inches thick.
B'1—8 to 13 inches, light yellowish-brown (10YR 6/4) very stony sandy loam; weak, thick, platy structure that breaks to weak, fine, subangular blocky; friable when when moist; pH 5.3; clear, wavy boundary; 4 to 6 inches thick.
B'2—13 to 23 inches, brownish (10YR 6/6) very stony sandy loam; weak, medium to coarse, subangular blocky structure; friable when moist; pH 5.1; clear, wavy boundary; 9 to 11 inches thick.
C1—23 to 32 inches, yellowish-brown (10YR 5/6) very stony sandy loam; weak, medium, platy structure that ranges to nearly structureless; friable when moist; pH 5.0; clear, irregular boundary; 7 to 11 inches thick.
C2—32 inches +, weathered, yellow and gray sandstone.

Thickness of the gray, strongly leached A2 horizon ranges from 0 to 4 inches, which is the maximum allowable thickness of an A2 horizon in a Dekalb soil. In places there is a Bir horizon, which is as much as ¼ inch thick but seldom is thicker. The B2 or B22 horizon is absent in places. A transition zone occurs between the A and B horizons in many places.

The color of these soils is typically 10YR in hue, but in a few places it is 7.5YR or 2.5Y. The chroma is moderately high and ranges from 4 to 6.

Typically, the texture of these soils is sandy loam, but it ranges from sandy clay loam to loamy sand. In most places the A2 and C horizons have a texture of loamy sand.

Generally, these soils have weak, medium to coarse, subangular blocky structure in the B horizon and single grain and platy structure in the A2 and C horizons. In places where there is a thin Bir horizon, the material is firm to very firm. A slight amount of clay movement occurs, but in places it is difficult to detect. Where the A2 horizon is thicker than 4 inches and the Bir or Bh horizon is not irregular and has material thickness, characteristics of podzols are dominant, and the soil is classified as Leetonia.

The content of stones or other coarse fragments in these soils ranges from 25 to 85 percent, by volume.

Generally, the solum ranges from 14 to 36 inches in depth. Depth to hard rock ranges from 2 to 4 feet.

GILPIN SERIES

In the Gilpin series are moderately deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils formed in material weathered from yellow- or olive-colored shale and sandy shale. Gilpin soils have a thicker solum than the Montevallo soils and lack the reddish hue of the Leck Kill soils. In contrast to the Berks soils, they have a thin, textural B horizon and contain fewer coarse fragments. They have a thinner solum than the Hartleton soils and are shallower to hard rock. In this county Gilpin soils occupy a small acreage and are mostly in woodland.

Typical profile of a Gilpin silt loam, 3 to 8 percent slopes, in woodland.

O2—½ inch or less of black, well-decomposed organic matter heavily matted with fine rootlets of living plants.
A1—0 to ½ inch, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure; friable to very friable when moist; many fine roots; 5 percent shale chips; pH 5.2; abrupt, wavy boundary; ¼ to 1 inch thick.
A2—½ inch to 4 inches, brown (10YR 5/3) silt loam; weak, fine, subangular blocky structure that breaks to weak, fine, granular; friable to very friable when moist; 5 to 10 percent shale chips; pH 5.2; clear, wavy boundary; 3 to 5 inches thick.
B1—4 to 13 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable when moist; a few, faint clay films; 10 to 15 percent shale chips; pH 5.2; clear, wavy boundary; 8 to 10 inches thick.
B2—13 to 23 inches, yellowish-brown (10YR 5/4) shaly silty clay loam; in places streaks and stains of dark gray (10YR 4/1) are on the surfaces of peds and in cracks and pores; moderate, medium, subangular blocky structure; friable when moist; 15 percent shale chips; pH 5.2; abrupt, wavy boundary; 3 to 5 inches thick.
C—23 to 30 inches, dark-gray very shaly silt loam; firm in place, friable when disturbed; pH 5.2; 90 percent coarse fragments.

Typically, the color of the various horizons is 10YR in hue, but the hue ranges from 7.5YR to 2.5Y. The texture of the surface soil is silt loam and shaly silt loam. The number of shale chips and small sandstone fragments increase with increasing depth and the quantity varies from place to place. Small very stony areas are indicated by stone symbols on the detailed soil map. Depth of the solum ranges from 18 to 30 inches.

GUTHRIE SERIES

In the Guthrie series are poorly drained, nearly neutral Low-Humic Gley soils. These soils developed in residuum from limestone. They are in the limestone valleys, chiefly in areas below seeps and in slight depressions. Guthrie soils are associated with the Hagerstown and Lawrence soils. In places they are also associated with the Andover soils, but they have a considerably higher reaction than those soils. In addition, they are finer textured, contain fewer coarse fragments, and have a claypan rather than a fragipan. Guthrie soils occupy a small acreage and have slight agricultural importance.

Typical profile of Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded, in a pasture.

Ap—0 to 8 inches, very dark grayish brown (2.5Y 3/2) silt loam; moderate, coarse, granular structure; friable to slightly firm when moist, slightly sticky when wet; many roots; pH 6.8; abrupt, smooth boundary; 7 to 9 inches thick.
B1g—8 to 12 inches, light brownish-gray (2.5Y 6/2) silty clay loam; weak to moderate, medium, platy structure; slightly firm when moist, sticky and plastic when wet; in places there are discontinuous clay films and organic matter; many roots; pH 6.8; clear, irregular boundary; 3 to 8 inches thick.
B21—12 to 20 inches, pale-brown (10YR 6/3) silty clay; a few, fine, distinct mottles of strong brown (7.5YR 5/6) and light gray (10YR 7/1); strong, medium, blocky structure; firm when moist, sticky and plastic when wet; thin, continuous clay films; many roots to a

depth of 14 inches, and a few to a depth of 20 inches; pH 6.8; gradual, wavy boundary; 7 to 10 inches thick.

B22—20 to 26 inches, light olive-brown (2.5Y 5/4) silty clay; many, fine, distinct mottles of strong brown (7.5YR 5/6) and gray (N 5/0); fine, blocky structure; firm when moist, sticky and plastic when wet; thin, continuous clay films; pH 6.5; gradual, wavy boundary; 5 to 9 inches thick.

B23g—26 to 35 inches, gray (N 5/0) silty clay; many, medium, distinct mottles of strong brown (7.5YR 5/8); massive; firm when moist, sticky and plastic when wet; pH 5.8; gradual, wavy boundary; 7 to 12 inches thick.

B3—35 to 48 inches +, brown (10YR 5/3) silty clay; many, fine, distinct mottles of gray (N 5/0) and strong brown (7.5YR 5/6); massive; slightly firm when moist, sticky and plastic when wet; pH 5.8.

The texture of the surface soil ranges from silt loam to silty clay loam, and that of the subsoil is silty clay loam and silty clay. In the B horizon, the color ranges to as red as 7.5YR in hue but typically the hue is 10YR. Depth to mottling ranges from 8 to 15 inches. Depth of the solum generally ranges from 36 to 72 inches. The pH of the soils ranges from 5.8 to 7.2.

HAGERSTOWN SERIES

The Hagerstown series consists of deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in material weathered from relatively pure limestone and dolomite. They are associated with the moderately well drained Wiltshire soils and the poorly drained to somewhat poorly drained Guthrie. They differ from the Morrison soils in being less sandy or heavier textured throughout the profile and in containing less chert. The acreage of these soils is moderate in Clinton County, but the soils are important to the agriculture.

Profile of Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded, in a field of rotation hay in Porter Township, 0.5 mile northwest of Lamar on Route T321 (profile S58-Pa-18-9(1-7) sampled for laboratory analysis).

Ap—0 to 7 inches, brown to dark-brown (7.5YR 4/2-4/4) silt loam; weak, fine, granular structure; friable when moist, sticky when wet; pH 6.6; abrupt, smooth boundary; 6 to 8 inches thick.

B21—7 to 10 inches, yellowish-red (5YR 4/8) clay; moderate, fine, subangular blocky structure; firm when moist, sticky when wet; pH 6.8; gradual, wavy boundary; 2 to 5 inches thick.

B22—10 to 15 inches, reddish-brown (5YR 4/4) clay; moderate, fine, blocky structure; firm when moist, sticky when wet; pH 6.6; gradual, wavy boundary; 3 to 8 inches thick.

B23—15 to 21 inches, reddish-brown (5YR 4/4) clay; moderate, fine and medium, blocky structure; firm when moist, sticky when wet; common manganese films; lower boundary marked by fragments of shaly limestone; pH 6.4; abrupt, irregular boundary; 4 to 8 inches thick.

B24—21 to 28 inches, reddish-brown (5YR 4/4) clay; moderate, fine to medium, blocky structure; firm when moist, sticky when wet; moderately thick clay films; common manganese films; pH 6.1; clear, wavy boundary; 5 to 8 inches thick.

B3—28 to 32 inches, reddish-brown (5YR 4/4) clay that in places has dark reddish-brown (5YR 3/3) and light olive-brown (2.5Y 5/6) interiors; weak, medium, blocky and platy structure; friable when moist, slightly sticky when wet; thin, discontinuous clay films; pH 6.4; abrupt, irregular boundary; 2 to 6 inches thick.

C—32 to 33 inches, black (N 2/0) fine sandy loam coating on grains of dolomite; single grain; tongues of material from the B3 horizon penetrate large cracks between stones; coating on limestone fragments does not react with dilute hydrochloric acid; pH 7.8; ½ to 2 inches thick.

R—33 inches +, dark-gray, hard dolomitic limestone.

Profifile of Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded, in an apple orchard in Porter Township, 4.5 miles southwest of Mill Hall on Route 64 (profile S58-Pa-18-10(1-8) sampled for laboratory analysis).

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist; pH 6.6; abrupt, irregular boundary; 5 to 9 inches thick.

A2—6 to 11 inches, dark-brown (7.5YR 5/4) silty clay loam; weak, fine to medium, subangular blocky structure that in places is thin, platy; friable when moist; pH 6.6; abrupt, irregular boundary; 4 to 6 inches thick.

B1—11 to 16 inches, dark-brown (7.5YR 4/4) silty clay loam; weak to moderate, fine to medium, subangular blocky structure; friable when moist; pH 6.6; clear, irregular boundary; 4 to 10 inches thick.

B21—16 to 21 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable when moist; contains a few manganese coats; pH 6.6; clear, irregular boundary; 3 to 8 inches thick.

B22—21 to 28 inches, yellowish-red (5YR 4/6) silty clay loam that when crushed is yellowish red (5YR 5/8); moderate, medium and fine, blocky structure; friable to firm when moist; in places contains manganese coatings; pH 6.2; boundary of this horizon chosen arbitrarily, and the boundary and thickness are included in the next, or B23, horizon.

B23—28 to 34 inches, yellowish-red (5YR 5/8) silty clay; moderate, fine to medium, blocky structure; friable to firm when moist; pH 5.9; clear, wavy boundary; 11 to 16 inches thick.

B31—34 to 44 inches, yellowish-red (5YR 5/8) silty clay; weak, medium, blocky structure that breaks to weak, medium, platy; friable when moist; thick, continuous clay films on peds; pH 5.9; gradual, wavy boundary; 10 to 14 inches thick.

B32—44 to 54 inches, yellowish-red (5YR 5/8) silty clay with red (2.5YR 5/8) films on the outside; weak, medium, platy structure that breaks to weak, medium, blocky; thick, continuous clay films on peds; pH 5.9.

The color of the B22 horizon ranges from 7.5YR to 10R in hue. Reaction of the B horizon ranges from pH 5 to pH 7. The texture of the B horizon ranges from light silty clay loam to silty clay or clay. The structure is more strongly expressed in some soils than in others. Black films are on the peds at depths of 24 to 60 inches, and the quantity of the films varies. Streaks or mottles of color may or may not be present in the C horizon. Chert and limestone fragments vary in quantity throughout the profile but are not numerous. Rock outcrops and ledges range from a few to many.

HARTLETON SERIES

The Hartleton series consists of deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils formed mainly in material, derived from acid, gray and brown shale. In places the material was thoroughly mixed by pre-Wisconsin glaciation with smaller amounts of sandstone of the Catskill formation and dark shale of the Portage formation. Hartleton soils are associated with the shallow to very shallow Montevallo soils and the moderately well drained to somewhat poorly drained Comly. They have a deeper solum and contain somewhat less coarse fragments than the Berks soils and have more illuvial clay in the B horizon. In contrast to the Allenwood soils, Hart-

leton soils lack the diversity of material, such as quartzite and sandstone, that comprises part of the parent material of Allenwood soils. Also, they have somewhat yellower hues in the B horizon, and a less distinct B horizon. The acreage of Hartleton soils is small, and the soils are of slight agricultural importance.

Typical profile of Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded, in woodland.

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) channery silt loam; weak, fine, granular structure; very friable when moist; 25 percent shale fragments; many roots; pH 5.8; abrupt, wavy boundary; 1 to 3 inches thick.

A2—2 to 7 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, medium, platy structure that breaks to moderate, fine, granular; very friable when moist; many roots; 20 percent shale fragments; pH 5.4; abrupt, irregular boundary; 4 to 10 inches thick.

B1—7 to 15 inches, yellowish-brown (10YR 5/6) channery silt loam; weak, medium, subangular blocky structure; friable when moist; 20 percent coarse, dark-brown (10YR 3/3) shale fragments; many roots in the upper part, but they thin out toward the lower part; pH 5.6; abrupt, wavy boundary; 7 to 9 inches thick.

B21—15 to 22 inches, dark-brown (10YR 4/3) channery clay loam; moderate, medium, subangular blocky structure; friable when moist, sticky and slightly plastic when wet; thin, continuous clay films; 40 percent coarse shale fragments; pH 5.2; clear, wavy boundary; 6 to 9 inches thick.

B22—22 to 28 inches, dark-brown (10YR 4/3) channery clay loam; weak, thick, platy structure that breaks to moderate, fine, subangular blocky; friable when moist, sticky and plastic when wet; thick, continuous clay films of yellowish red (5YR 5/6); interior shale color is light olive brown (2.5Y 5/4); a few black films; 40 percent coarse shale fragments; pH 5.5; gradual wavy boundary; 5 to 9 inches thick.

B3—28 to 36 inches, dark-brown (7.5YR 4/4) channery loam; weak, thick, platy structure that breaks to moderate, fine, subangular blocky; friable when moist, slightly sticky when wet; thick, discontinuous clay films of strong brown (7.5YR 5/6); 40 percent coarse shale fragments of light olive brown (2.5Y 5/4); pH 5.5; 6 to 10 inches thick.

C—36 to 45 inches, 90 to 95 percent coarse shale fragments; common black films; silt and clay deposited on surface of coarse fragments and in voids.

The color of these soils ranges from 10YR to 5YR in hue, but typically the color is somewhat yellower than 7.5YR. The chroma is relatively high and ranges between 4 and 6. The texture of the B horizon typically is clay loam but in places is silt loam or loam. Generally, the percentage of coarse fragments is relatively high, but it ranges from less than 10 percent to 40 percent or more, by volume. Reaction ranges between pH 5.0 and 6.0. The solum ranges from 2 to 4 feet in depth. Depth to hard rock ranges from 3 to 8 feet.

HARTSELLS SERIES

In the Hartsells series are deep, well-drained Red-Yellow Podzolic soils. These soils developed mainly in residuum from gray, medium- and coarse-grained sandstone but partly in residuum from shale. They are mainly on smooth areas near ridgetops. Hartsells soils are associated with the moderately well drained Cookport soils, the poorly drained Nolo soils, and the very poorly drained Lickdale. They are deeper than the Dekalb soils and have more accumulation of illuvial clay in their B horizon. The acreage of Hartsells soils in Clinton County is small, and the soils are not agriculturally important.

Typical profile of Hartsells channery loam, 3 to 8 percent slopes, in woodland.

A1—0 to 2 inches, very dark gray (10YR 3/1) channery loam; weak, very fine, granular structure; very friable when moist; 15 percent coarse fragments; pH 6.2; abrupt, wavy boundary; 1 to 3 inches thick.

A2—2 to 3 inches, light-gray (10YR 6/1) channery loam; weak, thin, platy structure; very friable when moist; 15 percent coarse fragments; pH 6.2; abrupt, wavy boundary; ½ to 1½ inches thick.

A3—3 to 8 inches, yellowish-brown (10YR 5/6) channery loam; weak, fine, granular structure; very friable when moist; 15 percent coarse fragments; pH 5.6; clear, wavy boundary; 4 to 6 inches thick.

B1—8 to 13 inches, yellowish-brown (10YR 5/8) sandy loam; weak, thin, platy structure that breaks to moderate, fine, subangular blocky; friable when moist; 10 to 15 percent coarse fragments; pH 4.8; clear, wavy boundary; 4 to 6 inches thick.

B21—13 to 18 inches, strong-brown (7.5YR 5/8) channery sandy clay loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 15 to 20 percent coarse fragments; pH 4.8; clear, wavy boundary; 4 to 6 inches thick.

B22—18 to 26 inches, strong-brown (7.5YR 5/6) channery sandy clay loam; moderate and medium subangular blocky structure; friable when moist, sticky and slightly plastic when wet; thin, continuous clay films; 15 to 20 percent coarse fragments; pH 4.8; clear, wavy boundary; 7 to 9 inches thick.

B23—26 to 32 inches, strong-brown (7.5YR 5/6) channery loam; moderate, coarse, subangular blocky structure; friable and slightly firm when moist, slightly sticky and slightly plastic when wet; 20 to 30 percent coarse fragments; thin, discontinuous clay films; pH 4.9; abrupt, wavy boundary; 5 to 7 inches thick.

B3—32 to 38 inches, strong-brown (7.5YR 5/6) channery sandy loam; weak, coarse, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 40 to 50 percent coarse fragments; clay bridging in places; pH 4.9; clear, wavy boundary; 5 to 7 inches thick.

C—38 to 46 inches, brown (7.5YR 4/4) very channery sandy loam; structureless; friable when moist, nonsticky and nonplastic when wet; 50 to 60 percent coarse fragments; pH 5.0.

The color of the subsoil ranges from yellowish brown to strong brown. The stones in the soils range from a few small fragments of sandstone to many large fragments. In the Allegheny Plateau north of Lock Haven, red sandstone fragments from the Catskill formation give the soils a reddish hue. The solum ranges from 2½ to 3½ feet in depth. Depth to hard rock ranges from 3 to 5 feet.

HUNTINGTON SERIES

The Huntington series consists of deep, well-drained soils that are in the Alluvial great soil group. These soils formed in sediments washed mainly from sandstone and shale uplands but partly from limestone valleys. The Huntington soils are associated with the Lindside, Newark, and Melvin soils. They are similar to the Pope soils but have a higher reaction and are generally browner throughout the profile. Huntington soils have less profile development than the Ashton soils and are subject to more frequent flooding. The acreage of these soils is fairly small in Clinton County, but the soils are fertile and are farmed intensively.

Typical profile of Huntington silt loam in a cultivated field.

Ap—0 to 10 inches, dark-brown (10 YR 3/3) silt loam; weak to moderate, fine, granular structure; friable when moist, nonsticky when wet; many roots; pH 6.8; abrupt,

smooth boundary; 7 to 9 inches thick.

C1—10 to 36 inches, dark-brown (10YR 3/3) light silty clay loam or silt loam; weak, medium, subangular blocky structure; friable when moist; a few fine pebbles; pH 6.8.

C2—36 to 52 inches +, brown (10YR 5/3) and dark reddish-brown (5YR 3/3) stratified layers of silt loam, fine sandy loam, and loam, and of sandy and gravelly material; pH 6.8.

In places the material is fine sandy loam, and in small areas it is gravelly sandy loam. The material is slightly mottled in a few places at a depth below 36 inches. The color ranges from 5YR to 10YR in hue, and the value and chroma are low. Dark- and light-brown patches of color occur at random. The soils that formed in material washed from limestone valleys generally are finer textured than other Huntington soils. In a few places patches of sand occur, and in some places there are sandstone fragments and gravel.

KLINESVILLE SERIES

In the Klinesville series are shallow to very shallow, well-drained Lithosols that are intergrading toward Sols Bruns Acides. These soils are underlain by red shale, siltstone, and sandstone. They are moderately steep to steep, contain many coarse fragments, and lack a distinct B horizon. Klinesville soils are associated with the moderately deep Leck Kill soils. They are similar to the Montevallo soils in depth, but they have a reddish hue. The acreage of these soils is small, and the soils are of little agricultural importance.

Typical profile of Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded, in an idle field.

Ap—0 to 4 inches, reddish-brown (5YR 4/3) channery silt loam; weak, fine, granular structure; friable when moist; 45 percent coarse fragments; pH 5.9; clear, wavy boundary; 3 to 6 inches thick.

AC—4 to 12 inches, reddish-brown (5YR 4/4) very channery loam; weak, fine, subangular blocky structure; friable when moist; 70 percent coarse fragments; pH 5.6; clear, irregular boundary; 8 to 14 inches thick.

C—12 to 19 inches, reddish-brown (2.5YR 4/4) very channery loam; 80 to 90 percent coarse fragments; structureless; friable when moist; pH 5.6; gradual, wavy boundary; 5 to 9 inches thick.

R—19 inches +, reddish-brown (2.5YR 4/4), partly weathered shale.

The coarse fragments in the surface layer of these soils range from 10 to 90 percent. Depth to hard rock ranges from 10 to 24 inches.

LAIDIG SERIES

In the Laidig series are deep, well-drained Red-Yellow Podzolic soils that are on sloping benches at the base of mountains in the Ridge and Valley province. These soils formed on material that has accumulated as the result of downhill movement by soil creep and frost action. In a few places they have a thin Podzol profile. Laidig soils are coarser textured throughout the solum than the Murrill soils, have a fragipan in the lower part of the solum that contains more coarse sandstone fragments, and have a lower base status. They are associated with the moderately well drained to somewhat poorly drained Buchanan soils, the poorly drained to somewhat poorly drained Andover soils, and the very poorly drained Lickdale. Laidig soils occupy a small acreage in the county and are not important to the agriculture.

Profile of Laidig very stony loam, 8 to 25 percent slopes, in woodland in Greene Township on State Forest Land, 0.6 of a mile from the boundary between Clinton County and Union County at Tea Springs (profile S59–Pa–18–17(1–9) sampled for laboratory analysis).

O1—A thin cover of litter, mostly of undecomposed red oak leaves, but that includes white oak, chestnut oak, and red maple leaves and a few white pine needles.

O2—2 inches or less of black (10YR 2/1), loamy organic matter; weak, very fine, granular structure; very friable when moist; 25 to 35 percent coarse fragments; pH 3.6; abrupt, wavy boundary; 1 to 3 inches thick.

A1—0 to 1 inch, dark yellowish-brown (10YR 3/4) very stony fine sandy loam; weak, fine, granular structure; very friable; 25 to 35 percent coarse fragments; pH 3.7; abrupt, irregular boundary; 1 to 2 inches thick.

A3—1 inch to 6 inches, reddish-yellow (7.5YR 6/8) very stony loam; weak, medium, granular structure; very friable; 25 to 35 percent coarse fragments; pH 4.3; clear, wavy boundary; 4 to 7 inches thick.

B1—6 to 10 inches, strong-brown (7.5YR 5/8) very stony loam; weak, fine, subangular blocky structure; friable when moist; very thin, discontinuous clay films; 15 percent coarse fragments; pH 4.7; clear, wavy boundary; 3 to 5 inches thick.

B21—10 to 22 inches, strong-brown (7.5YR 5/8) very stony loam; weak, medium, platy structure that breaks to weak, fine, subangular blocky; friable when moist; thin, discontinuous clay films; 15 percent coarse fragments; pH 4.5; clear, wavy boundary; 12 to 14 inches thick.

B22—22 to 31 inches, strong-brown (7.5YR 5/8) very stony loam; moderate, medium, subangular blocky structure; friable when moist; thin, continuous clay films; 30 to 40 percent coarse fragments; pH 4.6; clear, wavy boundary; 8 to 12 inches thick.

B23—31 to 43 inches, strong-brown (7.5YR 5/8) very stony sandy loam; moderate, medium, subangular blocky structure; firm in place, but only slightly firm when disturbed; thin, discontinuous clay films and in places clay bridging; 60 to 80 percent coarse fragments; pH 4.7; clear, wavy boundary; 10 to 14 inches thick.

Bx—43 to 60 inches, strong-brown (7.5YR 5/6) very stony fine sandy loam; many, coarse, distinct mottles of yellowish red (5YR 5/8) and light yellowish brown (10YR 6/4); weak, coarse to medium, subangular blocky structure; firm when moist; thin, discontinuous clay films; 60 to 80 percent coarse fragments; pH 4.6; clear, irregular boundary; 14 to 20 inches thick.

C—60 to 72 inches, strong-brown (7.5YR 5/8) very stony fine sandy loam; weak, medium, subangular blocky structure; firm in place; in places contains clay balls; 60 to 80 percent coarse fragments; pH 4.3.

Profile of Laidig very stony loam, 8 to 25 percent slopes, in woodland in Greene Township, 2.6 miles west of the boundary between Clinton and Union Counties on the Carrol-White Deer Creek Road (S59–Pa–18–18(1–10) sampled for laboratory analysis):

O1—3 to 2 inches of undecomposed leaves of white oak, red oak, and maple.

O2—2 inches or less of black (10YR 2/1), loamy organic matter; weak, fine, granular structure; very friable when moist, nonsticky when wet; about 25 percent coarse fragments; pH 4.2; abrupt, smooth boundary; 1 to 3 inches thick.

A1—0 to 4 inches, yellowish-brown (10YR 5/6) very stony loam; weak, medium, granular structure; friable when moist, slightly sticky when wet; 25 percent coarse fragments; pH 4.6; clear, wavy boundary; 2 to 4 inches thick.

A3—4 to 9 inches, yellowish-brown (10YR 5/8) very stony loam; weak, fine to medium, subangular blocky structure; friable when moist, slightly sticky when wet; a

few specks of black manganese; 25 to 30 percent coarse fragments; pH 4.8; clear, wavy boundary; 4 to 7 inches thick.

B1—9 to 15 inches, strong-brown (7.5YR 5/8) very stony loam; weak, fine to medium, subangular blocky structure; friable when moist, slightly sticky when wet; 30 to 40 percent coarse fragments; pH 4.6; clear, irregular boundary; 4 to 8 inches thick.

B21—15 to 25 inches, strong-brown (7.5YR 5/6) very stony loam; weak, medium, subangular blocky structure; friable when moist, slightly sticky to sticky when wet; thin, discontinuous clay films; a few to many black films and concretions; 20 to 30 percent coarse fragments; pH 4.8; clear, irregular boundary; 8 to 12 inches thick.

B22—25 to 33 inches, yellowish-red (5YR 5/8) very stony clay loam; weak, medium, subangular blocky structure that in places is platy; firm in place, friable when disturbed, and slightly sticky when wet; many thick coats of manganese and thick, discontinuous clay films; 20 to 30 percent coarse fragments; pH 5.0; clear, wavy boundary; 6 to 9 inches thick.

B23—33 to 46 inches, yellowish-red (5YR 5/8) very stony clay loam; moderate, medium, subangular blocky structure; firm in place, friable when disturbed, and sticky when first moistened; thin and thick, discontinuous clay films; a few manganese coats; 15 to 20 percent coarse fragments; pH 5.2; clear, wavy boundary; 12 to 15 inches thick.

B24—46 to 55 inches, yellowish-red (5YR 5/8) very stony clay loam; weak, fine and medium, subangular blocky structure; firm in place, friable when disturbed, and slightly sticky to sticky when wet; thick, discontinuous clay films; a few to many manganese films; 15 to 20 percent is yellowish-brown (10YR 5/8) shale fragments; pH 5.2; gradual, irregular boundary; 7 to 11 inches thick.

Bx1—55 to 63 inches, yellowish-red (5YR 5/8) very stony clay loam; a few, fine, distinct, pinkish-white (7.5YR 7/2) specks; weak, fine, subangular blocky structure that in places is platy; firm in place when moist, sticky when wet; a few to many manganese films; 15 to 20 percent coarse fragments; pH 5.0; gradual, irregular boundary; 7 to 12 inches thick.

Bx2—63 to 70 inches +, strong-brown (7YR 5/8) very stony silty clay loam; many fine, prominent mottles of yellowish brown (10YR 5/8), pinkish white (7.5YR 7/2), and red (2.5YR 5/8); weak, thin, platy structure that breaks to weak, fine, granular; very firm in place when moist, sticky when wet; clay bridging in places; a few manganese films; 10 percent coarse fragments; pH 5.0.

The color of the surface soil ranges from yellowish brown to strong brown or reddish yellow, and that of the subsoil ranges from strong brown to yellowish red. The texture of the surface soil is dominantly loam to sandy loam, but very stony and stony soils are common. Coarse fragments in the soils range from 25 to 60 percent, by volume. Depth to the fragipan ranges from 30 to 60 inches. Although the soils are well drained, drainage is restricted in places at a depth of more than 3 feet. Depth of the solum ranges from 4 to 8 feet, and depth of unconsolidated material over bedrock ranges from 3 to 15 feet or more.

LEADVALE SERIES

The Leadvale series consists of deep, moderately well drained to somewhat poorly drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in material weathered from acid gray shale, siltstone, and sandstone. They are on the lower part of slopes in the Allegheny Plateau part of the county. Leadvale soils are associated with Gilpin, Berks, and Cavode soils. They are deeper than the Cookport soils and are finer textured and have a less distinct fragipan.

Typical profile of Leadvale silt loam, 8 to 15 percent slopes, in woodland.

A1—0 to 2 inches, black (10YR 2/1) silt loam; weak, fine, granular structure; very friable when moist; 2 percent coarse fragments; pH 5.0; abrupt, wavy boundary; 1 to 3 inches thick.

A2—2 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable when moist; 2 percent coarse fragments; pH 5.2; clear, wavy boundary; 3 to 5 inches thick.

A3—6 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, platy structure that breaks to moderate, fine, granular; friable when moist; 5 percent coarse fragments; pH 5.2; clear, wavy boundary; 5 to 7 inches thick.

B1—11 to 17 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, medium, platy structure that breaks to moderate, fine, subangular blocky; very friable when moist, slightly sticky and slightly plastic when wet; 10 percent coarse fragments; thin, discontinuous clay films; pH 5.3; clear, wavy boundary; 5 to 7 inches thick.

B21—17 to 23 inches, yellowish-brown (10YR 5/6) silty clay loam; a few, fine, distinct mottles of strong brown (7.5YR 5/8) and pale brown (10YR 6/3); moderate, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; 20 percent coarse fragments; thin, discontinuous clay films; pH 5.3; abrupt, wavy boundary; 5 to 7 inches thick.

B22—23 to 30 inches, pale-brown (10YR 6/3) silty clay loam; many, coarse, distinct mottles of strong brown (7.5YR 5/8) and gray (10YR 6/1); moderate, thick, platy structure that breaks to moderate, medium, angular blocky; friable to slightly firm when moist, sticky and plastic when wet; 10 percent coarse fragments; thick, continuous clay films; pH 5.2; abrupt, wavy boundary; 6 to 8 inches thick.

Bx—30 to 40 inches, brown (10YR 5/3) silty clay loam; moderate, coarse, distinct mottles of light gray (10 YR 7/2) and strong brown (7.5YR 5/8); common, black films (10YR 2/1); massive but breaks to weak, thick, platy structure; very firm in place, sticky and plastic when wet; 30 percent coarse fragments that increase in number with increasing depth; pH 4.8.

Depth of the solum ranges from 3 to 5 feet, and depth to hard rock ranges from 4 to 10 feet or more. The less deep soils are on the upper side of colluvial slopes near the base of adjacent slopes, where the soils developed from residuum. Depth to mottling ranges from 14 to 30 inches. Coarse fragments in the soils range from 5 to 40 percent. Large sandstones are scattered over the surface and throughout the soil in places.

LECK KILL SERIES

The Leck Kill series consists of moderately deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in reddish-brown, strongly weathered, pre-Wisconsin glacial till and in residuum derived from acid red shale and sandstone. They have a redder hue and a more distinct B horizon than the Berks soils and generally contain fewer coarse fragments. Leck Kill soils are finer textured than the Lehew soils, which lack a textural B horizon, and they have a thicker solum than Klinesville soils. They are deeper than the Meckesville soils. The acreage of Leck Kill soils is small, and the soils have slight agricultural importance.

Typical profile of Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded, in a cultivated field.

Ap—0 to 7 inches, dark-brown (7.5YR 3/2) channery silt loam; weak, fine, granular structure; friable when moist, non-sticky when wet; 15 percent coarse fragments; pH 7.0; abrupt, wavy boundary; 6 to 8 inches thick.

B21—7 to 13 inches, reddish-brown (2.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable when moist, slightly sticky and plastic when wet; 10 percent shale and sandstone fragments that are ½ to 3 inches in diameter; pH 6.6; clear, wavy boundary; 5 to 8 inches thick.

B22—13 to 18 inches, reddish-brown (5YR 4/3) channery silty clay loam; moderate, fine to medium, subangular blocky structure; friable to firm when moist, sticky and plastic when wet; thin, continuous clay films; 15 percent shale and sandstone fragments that are ½ to 3 inches in diameter; pH 5.8; clear, wavy boundary; 4 to 6 inches thick.

B23—18 to 24 inches, reddish-brown (2.5YR 4/4) channery silty clay loam; weak, medium, subangular blocky structure; friable to firm when moist, sticky and plastic when wet; thin, continuous clay films; 30 percent sandstone and shale fragments that are ½ to 8 inches in diameter; pH 5.5; clear, wavy boundary; 5 to 7 inches thick.

C—24 to 28 inches, light olive-brown (2.5Y 5/4), olive-brown (2.5Y 4/4), dark reddish-gray (5YR 4/2), and dark-gray (10YR 4/1) fragments, principally of sandstone and shale, that are 3 to 6 inches in diameter; reddish-brown (2.5YR 5/4), moderately thick clay films.

The range in texture of the surface soil is narrow, and silt loams are dominant. Typically the hue is slightly browner than 2.5YR. The texture of the B horizon ranges from silt loam to silty clay loam. Depth of the solum ranges from 20 to 32 inches, and the deeper soils are near the bottom of the slopes. In places in the lower part of the B horizon of the deeper soils, the material is slightly firm and manganese films are common. Shale and sandstone fragments in these soils range from 5 to 40 percent, by volume.

LEETONIA SERIES

In the Leetonia series are moderately deep to deep, coarse-textured, well-drained, extremely acid soils that belong to the Podzol great soil group. These soils developed in coarse, sandy, generally very stony material weathered from hard gray sandstone, conglomerate, and quartzite. They are mostly on broad high plateaus and ridgetops that are gently sloping to moderately sloping. A thin, dark-colored, organic layer covers the surface soil. The A2 horizon is about one-half foot thick, is sandy, and is a light grayish color; tongues of this horizon extend into the B horizon. The B horizon is thick, and the soil particles are stained brown by illuvial iron and organic carbon.

Leetonia soils are associated with the Dekalb, Hartsells, and Cookport soils. They are similar to the Dekalb soils, but they have thicker, more prominent A and B horizons and generally a somewhat coarser texture. Leetonia soils are not so deep as the Hartsells soils, which have a textural B horizon. Unlike the Cookport soils, Leetonia soils lack a fragipan. These soils are low to very low in fertility and are mostly in woodland. The acreage is small.

Typical profile of Leetonia very stony sandy loam, 0 to 8 percent slopes, in woodland.

O1—2 inches to 1 inch of mixed deciduous and coniferous forest litter.

O2—1 inch or less of black (N 2/1), very strongly acid, partly decomposed leaf litter that is matted with fine roots.

A1—0 to 2 inches, very dark brown (10YR 2/2) very stony sandy loam that contains many white sand grains; weak, very fine, granular structure; very friable when moist; 30 percent coarse fragments; very strongly acid; abrupt, wavy boundary; 1 to 3 inches thick.

A2—2 to 10 inches, light-gray (10YR 7/1 to 7/2) very stony sandy loam to loamy sand; structureless to weak, very fine, granular structure; loose to very friable when moist; 30 percent coarse fragments; very strongly acid to extremely acid; abrupt, irregular boundary; 5 to 10 inches thick.

Bir—10 to 24 inches, yellowish-brown (10YR 5/8) to dark yellowish-brown (10YR 4/4) very stony sandy loam; weak, fine, subangular blocky structure; very friable to friable when moist, slightly sticky and nonplastic when wet; 40 percent coarse fragments; very strongly acid; gradual, wavy boundary; 10 to 20 inches thick.

C—24 to 34 inches, yellowish-brown (10YR 6/8) to brown (10 YR 5/3) very stony and channery sandy loam to loamy sand; structureless; loose to very friable when moist; 80 percent coarse fragments; very strongly acid; gradual, irregular boundary; 6 to 18 inches thick.

R—34 inches +, partly weathered, hard, gray sandstone.

The A2 horizon ranges from white to pale brown in color and from 4 to 12 inches in thickness. The B horizon ranges from light olive brown to dark brown. Thickness of the Bir horizon ranges from 8 to 24 inches. The Bir horizon is moderately to weakly cemented in places. It is firm in place and is hard when dry. The texture of the soils ranges from loamy sand to fine sandy loam, and very stony soils are predominant. Coarse fragments in the soils range from a few to 80 percent or more. In many places these soils are skeletal throughout the solum. The soils range from strongly acid to extremely acid. The solum ranges from about 20 to 34 inches in depth. Depth to hard rock ranges from 2 to 4 feet.

LEHEW SERIES

In the Lehew series are moderately deep, well-drained Sols Bruns Acides that developed in material weathered from reddish sandstone. They are in the mountainous areas of the county. Lehew soils are deeper, less silty, and more sandy in the subsoil than Klinesville soils. They are coarser textured than the Leck Kill soils and have a less well-developed B horizon. They are not so deep as the Ungers soils. Lehew soils have a redder hue than the Dekalb soils, but like the Dekalb, they are mostly in forest. The acreage of the Lehew soils is large, but the soils are not agriculturally important.

Typical profile of Lehew very stony loam, 8 to 25 percent slopes, in woodland.

O1—1 inch or less of hardwood leaf litter, mainly from chestnut oak, red oak, and white oak.

A1—0 to 1 inch, black (10YR 2/1) very stony sandy loam; weak, fine, granular structure; friable when moist; pH 4.5; abrupt, wavy boundary; 1 to 2 inches thick.

A21—1 to 2 inches, pinkish-gray (7.5YR 6/2) very stony sandy loam; single grain; friable when moist; 40 percent coarse fragments; pH 4.2; abrupt, irregular boundary; 1 to 2 inches thick.

A22—2 to 7 inches, reddish-brown (5YR 4/3) very stony loam; weak, fine, granular structure; friable when moist; 50 percent coarse fragments; pH 4.6; clear, wavy boundary; 4 to 7 inches thick.

B2—7 to 24 inches, reddish-brown (2.5YR 4/4) very stony sandy loam; weak, medium, subangular blocky structure; friable when moist; 60 to 70 percent coarse fragments; pH 4.8; gradual, wavy boundary; 12 to 16 inches thick.

C—24 to 30 inches, reddish-brown (2.5YR 4/4) very stony sandy loam between sandstone fragments; weak, fine, subangular blocky structure; friable when moist; 90

percent coarse sandstone fragments; pH 4.8; 3 to 6 inches thick.

R—30 inches +, reddish, fine-grained sandstone.

The texture of the surface soil is very stony loam or channery loam. Typically the texture of the subsoil is sandy loam. Coarse fragments in the soils range from 20 to 90 percent. The solum ranges from 18 to 30 inches in depth. Depth to hard rock ranges from 2 to 3½ feet. In places, especially in the northern part of the county, the parent material weathered from shale.

LICKDALE SERIES

In the Lickdale series are very poorly drained, nearly level, Humic Gley soils that developed in material weathered from acid sandstone, conglomerate, siltstone, and shale. These soils are in depressions, in drainageways, and at the heads of streams where the water table is near the surface and the soil is saturated for long periods. The solum is generally more than 30 inches thick and lacks a distinct fragipan. The upper part of the profile contains organic carbon and is dark colored; the subsoil is strongly gleyed. These soils are in both residual and colluvial positions. They are associated with other soils that developed in parent material weathered from acid rock. Lickdale soils have a thicker, darker colored A horizon than the Andover, Nolo, Purdy, and Brinkerton soils. The areas are small, and the soils are of slight agricultural importance.

Typical profile of Lickdale silt loam, 0 to 5 percent slopes, in a wooded area.

O2—2 inches or less of black (N 2/0), partly decayed forest litter; burning has occurred in places, and here the layer is absent.

A1—0 to 10 inches, very dark gray (10YR 3/1) to black (N 2/0) silt loam; a few, fine, distinct mottles of dark brown (7.5YR 4/4); weak, fine, granular structure; friable when moist; high content of organic matter; very strongly acid (pH 5.0); abrupt, smooth boundary; 8 to 14 inches thick.

B1g—10 to 12 inches, light brownish-gray to pale-brown (10YR 6/2 to 6/3) clay loam; common, coarse, distinct mottles of strong brown (7.5YR 5/6); very weak, coarse, subangular blocky structure; firm when moist; very strongly acid (pH 5.8); clear, smooth boundary; 1 to 4 inches thick.

B2—12 to 27 inches, yellowish-brown (10YR 5/8) to brownish-yellow (10YR 6/8) silty clay loam to clay loam; many, coarse, prominent mottles of light gray (N 7/0); weak, coarse, prismatic structure that breaks to weak, medium, blocky; firm when moist; very strongly acid (pH 4.8); gradual, wavy boundary; 10 to 20 inches thick.

C—27 to 36 inches +, yellowish-brown (10YR 5/8) to dark yellowish-brown (10YR 4/4) silty clay; a few, coarse, prominent mottles of light gray (N 7/0) and yellowish red (5YR 4/8); massive; firm when moist; pH 4.8.

Generally the texture of the surface soil is silt loam, but in places it is silty clay loam or loam. The B horizon ranges from clay loam to silty clay, depending on the kind of parent material. Where the soils are underlain by sandstone, fragments of sandstone occur throughout the solum. Bedrock of sandstone, siltstone, and shale generally is within 50 inches of the surface and in places is at a depth of 24 inches.

LINDSIDE SERIES

In the Lindside series are deep, moderately well drained soils that are in the Alluvial great soil group. These soils developed along streams in sediments washed from upland areas underlain by limestone or that are strongly influenced by limestone. They are associated with the well-drained Huntington soils, the somewhat poorly drained Newark soils, and the poorly drained Melvin. Lindside soils are flooded occasionally in spring. Most areas are used for crops and pasture.

Typical profile of Lindside silt loam in a cultivated field.

Ap—0 to 12 inches, brown (10YR 4/4) silt loam; weak, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; pH 6.6; clear, smooth boundary; 10 to 13 inches thick.

C1—12 to 22 inches, dark-brown (10YR 3/3) silt loam; weak, medium, platy structure that breaks to weak, fine, granular; friable when moist, sticky and slightly plastic when wet; pH 6.4; clear smooth boundary, 8 to 14 inches thick.

C2—22 to 38 inches, dark yellowish-brown (10YR 4/4) silt loam; many, medium, distinct mottles of grayish brown (10YR 5/2) and strong brown (7.5YR 5/6); weak, fine, prismatic structure that breaks to weak, thin, platy; friable when moist, slightly sticky and slightly plastic when wet; pH 6.8; clear, wavy boundary; 12 to 20 inches thick.

C3g—38 to 60 inches +, dark grayish-brown (10YR 4/2) silt loam to sandy loam; many, coarse, distinct mottles of gray (N 5/0) and brownish yellow (10YR 6/6); stratified in places; structureless; gravel in places; pH 6.8.

The texture of the surface soil ranges from silt loam to sandy loam. The color of the soils ranges from 7.5YR to 10YR in hue. Reaction of the C horizon ranges from medium acid to neutral. In places the soils contain much gravel.

MECKESVILLE SERIES

The Meckesville series consists of deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils are in colluvial positions. They developed in material weathered mainly from noncalcareous red shale and sandstone. Meckesville soils are deeper than Lehew soils. They are also finer textured and have a more distinct B horizon. They are lighter textured and less deep than the Upshur soils and have fewer coarse fragments. Meckesville soils are associated with the moderately well drained to somewhat poorly drained Albrights soils. The acreage is small, and the soils have little agricultural importance.

Profile of Meckesville silt loam, 8 to 15 percent slopes, moderately eroded, in a cultivated field in Beech Creek Township on Route 18009 (profile S58-Pa-18-14(1-7) sampled for laboratory analysis).

Ap—0 to 8 inches, dark reddish-brown (5YR 3/2) silt loam; weak, fine, granular structure; friable when moist; pH 7.2; clear, wavy boundary; 6 to 10 inches thick.

A3—8 to 12 inches, dark reddish-brown (5YR 3/2) channery silt loam; weak, fine, subangular blocky structure with some weak, thin, platy at the top of the horizon; friable when moist; pH 7.5; clear, wavy boundary; 2 to 6 inches thick.

B1—12 to 17 inches, reddish-brown (2.5Y 4/4) channery silt loam; moderate, medium, subangular blocky structure; friable when moist, slightly plastic when wet; partial clay films; pH 7.3; gradual, wavy boundary; 3 to 7 inches thick.

B21—17 to 23 inches, reddish-brown (2.5YR 4/4) loam; moderate, medium, blocky structure; friable to slightly firm when moist but plastic when wet; prominent clay films; pH 7.2; gradual, wavy boundary; 4 to 8 inches thick.

B22—23 to 29 inches, weak-red (10R 4/3) channery loam; moderate, medium, blocky structure; firm in place when moist but sticky and plastic when wet; thin clay

films; pH 5.6; gradual, irregular boundary; 3 to 9 inches thick.

B31—29 to 38 inches, dusky-red (10YR 3/2) channery loam; moderate, medium and coarse, blocky structure; firm in place when moist but sticky and plastic when wet; thin clay films; pH 5.3; clear, irregular boundary; 6 to 12 inches thick.

B32—38 to 47 inches +, weak-red (10R 4/3) channery silt loam; a few, medium, distinct mottles of reddish brown (5YR 4/4) and coatings of gray (5YR 6/1); weak, thick, platy and weak, medium, blocky structure; firm in place when moist, slightly plastic when wet; prominent clay films in larger pores; pH 5.1.

Profile of Meckesville silt loam, 8 to 15 percent slopes, in woodland in Bald Eagle Township, 3 miles north of Lock Haven on U.S. Route 120 (profile S58–Pa–18–16-(1–8) sampled for laboratory analysis).

O2—½ inch or less of decomposed leaves and debris that is 10 percent sand and silt; pH 4.8.

A1—0 to 2 inches, black (N 2/0) silt loam; weak, fine, granular structure; very friable when moist; pH 4.6; abrupt, wavy boundary; 1 to 3 inches thick.

A2—2 to 5 inches, reddish-brown (5YR 4/4) silt loam; weak, fine to medium, granular structure; very friable when moist; pH 5.0; clear, wavy boundary; 2 to 4 inches thick.

A3—5 to 10 inches, reddish-brown (5YR 4/3) silt loam; weak, thick, platy structure that breaks to weak, fine, subangular blocky; friable to slightly firm when moist; thin, continuous clay films; pH 5.2; gradual, wavy boundary; 4 to 7 inches thick.

B1—10 to 16 inches, reddish-brown (5YR 4/3) gravelly silt loam; moderate, medium, subangular blocky structure; friable to firm when moist but slightly sticky and plastic when wet; thin, continuous clay films; pH 5.6; gradual, wavy boundary; 5 to 8 inches thick.

B21—16 to 25 inches, reddish-brown (5YR 4/3) gravelly silt loam; weak, thick, platy structure that breaks to moderate, medium, subangular blocky; friable to firm when moist but sticky and plastic when wet; moderately thick, continuous clay films; pH 5.6; clear, wavy boundary; 7 to 12 inches thick.

Bx1—25 to 36 inches, reddish-brown (5YR 4/3) gravelly loam; a few, medium, distinct mottles of yellowish red (5YR 5/2); weak, thick, platy structure that breaks to moderate, medium to coarse, subangular blocky; firm when moist, slightly sticky and plastic when wet; thin, discontinuous clay films; black coatings in places; pH 5.2; clear, wavy boundary; 9 to 14 inches thick.

Bx2—36 to 45 inches, reddish-brown (5YR 4/3) gravelly loam; common, fine, distinct mottles of strong brown (7.5YR 5/8) and reddish yellow (7.5YR 7/6); weak, medium, subangular blocky structure that is platy in places; firm when moist, slightly sticky and plastic when wet; thin, discontinuous clay films; pH 5.0; clear, wavy boundary; 7 to 12 inches thick.

Bx3—45 to 48 inches, dark-red (2.5YR 3/6) gravelly clay loam; in places reddish-brown (5YR 4/4) and pale-red (2.5-YR 6/2) coatings on peds; weak, coarse, prismatic structure that breaks to moderate, coarse, blocky; firm when moist, plastic when wet; thick, discontinuous clay films; pH 5.0.

These soils are dominantly silt loams, but channery silt loams and shaly silt loams occupy small areas. The color of the soils ranges between 10R and 5YR in hue but is dominantly 5YR. The texture of the subsoil is silt loam and loam. In places at a depth below 3 feet, the material is firm and mottled. Coarse fragments in the soils range from 10 to 25 percent, by volume, in the upper part of the solum, and their number increases with increasing depth. Reaction in the subsoil ranges from pH 5.0 to 5.6. Depth of the solum ranges from 4 to 10 feet.

MELVIN SERIES

In the Melvin series are poorly drained soils that are in the Low-Humic Gley great soil group. These soils developed on flood plains in sediments washed from uplands underlain by limestone. They are heavier textured than the Atkins soils and generally are less acid. Melvin soils are associated with the well drained Huntington soils, the moderately well drained Lindside soils, and the somewhat poorly drained Newark. They are subject to overflow in spring. These soils generally are used for pasture or for cultivated crops when drained.

Typical profile of a Melvin silt loam in a cultivated field.

Ap—0 to 10 inches, very dark grayish brown (2.5Y 3/2) silt loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; many roots; pH 6.8; abrupt, smooth boundary; 9 to 12 inches thick.

C1g—10 to 16 inches, dark-gray (10YR 4/1) heavy silt loam; common, fine, prominent mottles of yellowish red (5YR 4/8) and dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; moderate silt and clay films on the larger surfaces and a few iron and manganese coatings; friable when moist, slightly sticky and slightly plastic when wet; a few roots; pH 6.6; clear, wavy boundary; 4 to 8 inches thick.

C2g—16 to 27 inches, gray (10YR 5/1) silty clay loam; many, fine and medium, prominent mottles of yellowish red (5YR 4/6 and 5YR 5/6); moderate, very coarse, prismatic structure that breaks to moderate, medium, coarse blocky; thick silt and clay films on prisms and thinner films on blocks; common iron and manganese coatings; friable when moist, sticky and plastic when wet; pH 6.0; gradual, wavy boundary; 7 to 11 inches thick.

C3g—27 to 33 inches, dark-gray (10YR 4/1) silty clay loam; many, medium, prominent mottles of dark grayish brown (10YR 4/2) and gray (10YR 5/1); moderate, very coarse, prismatic structure that breaks to moderate, medium, blocky; thick silt and clay coatings on prisms, and moderately thick films on blocks; common iron and manganese coats on peds; friable to firm when moist, sticky and plastic when wet; pH 6.4; gradual, wavy boundary; 4 to 8 inches thick.

C4g—33 to 44 inches, gray (10YR 5/1) silty clay loam; many, medium, prominent mottles of dark grayish brown (10YR 4/2) and yellowish red (5YR 4/6); weak, very coarse, prismatic structure that breaks to moderate, fine and medium, blocky; thick silt and clay films on prisms and thinner films on blocks; many, thick iron and manganese coatings on interior faces; firm when moist, sticky and plastic when wet; pH 6.8; gradual, wavy boundary; 8 to 15 inches thick.

C5—44 to 52 inches, dark yellowish-brown (10YR 4/4) silty clay loam; many, medium, prominent mottles of gray (10YR 5/1) and yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; thick silt and clay films in pores but thin on peds; many, thick iron and manganese coatings and a few concretions; firm when moist, sticky and plastic when wet; pH 6.8; 8 or more inches thick.

The texture of the subsoil is silt loam and silty clay loam in most places. The color of the B horizon ranges from 10YR to 7.5YR. In places there are lenses of silt and sand. Reaction ranges from pH 6.0 to 7.0. Depth to mottling ranges from 0 to 12 inches.

MONTEVALLO SERIES

The Montevallo series consists of shallow to very shallow, well-drained Lithosols that are intergrading toward Sols Bruns Acides. These soils developed in material weathered from gray and brown shale and from fine-grained sandstone. They contain a high proportion of coarse fragments and in many places are skeletal through-

out the solum. The B horizon is absent or is thin, discontinuous, and weakly developed. Montevallo soils are associated with the moderately deep Berks soils and the deep Hartleton soils. They are also associated with the moderately well drained to somewhat poorly drained Comly soils and the poorly drained Brinkerton soils.

Typical profile of a Montevallo channery silt loam, 15 to 35 percent slopes, severely eroded, in an idle field.

Ap—0 to 6 inches, brown (10YR 5/3) channery silt loam; weak, fine, granular structure; very friable when moist; 45 percent coarse fragments; pH 5.2; clear, smooth boundary; 4 to 7 inches thick.

AC—6 to 12 inches, yellowish-brown (10YR 5/4) very shaly silt loam; weak, fine, granular and weak, fine, subangular blocky structure; friable when moist; 70 percent coarse fragments; pH 5.2; gradual, wavy boundary; 5 to 8 inches thick.

C—12 to 16 inches, yellowish-brown (10YR 5/4) silt loam deposits on surface of coarse fragments and in voids between fragments; structureless; 95 percent coarse fragments; pH 5.4; clear, wavy boundary; 2 to 6 inches thick.

R—16 inches +, gray and brown, partly weathered shale.

The color of these soils ranges from yellowish brown to brown. Coarse fragments in the soils range from 30 to 80 percent. Reaction ranges from medium acid to very strongly acid. The solum ranges from 8 to 16 inches in depth. Depth to hard rock ranges from 1 to 2 feet.

MORRISON SERIES

In the Morrison series are deep to very deep, well-drained, coarse-textured Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in material weathered from weakly cemented, gray and yellow, calcareous sandstone and from sandy and cherty limestone. They are gently sloping to moderately sloping and are on ridges near the sandy Dekalb soils and the finer textured soils of the limestone valleys. The texture of the surface soil is typically sandy loam. The B horizon has a reddish hue and a moderate accumulation of illuvial clay. The solum is generally more than 3 feet thick and is underlain by a thick, sandy C horizon.

Morrison soils are coarser textured throughout than the Hagerstown soils and have a somewhat lower base status. They are deeper than the Dekalb soils, which lack a textural B horizon. They are less silty and more sandy than Hartsells soils and are also less acid and are generally deeper to hard rock. The acreage of the Morrison soils is small and is mostly wooded.

Typical profile of Morrison cherty sandy loam, 3 to 8 percent slopes, in woodland.

O1—2 inches to 1 inch of forest litter from deciduous trees.

O2—1 inch or less of black (N 2/1), strongly acid, partly decomposed leaf litter matted with fine roots.

A1—0 to 2 inches, very dark brown (10YR 2/2) cherty sandy loam; weak, fine, granular structure; very friable when moist, nonsticky when wet; many roots; 20 percent small chert and sandstone fragments; pH 4.8; abrupt, wavy boundary; 1 to 4 inches thick.

A2—2 to 9 inches, yellowish-brown (10YR 5/4) cherty sandy loam; weak, fine, granular structure; very friable when moist, nonsticky and nonplastic when wet; many roots; 20 percent small chert and sandstone fragments; pH 5.4; clear, wavy boundary; 6 to 11 inches thick.

B1—9 to 18 inches, yellowish-brown (10YR 5/8) cherty sandy loam; weak, fine, subangular blocky structure; friable when moist, nonsticky and nonplastic when wet; 20 percent chert and sandstone fragments; clay bridging in places; many roots; pH 5.3; clear, wavy boundary; 7 to 12 inches thick.

B21—18 to 27 inches, red (2.5YR 4/6) cherty sandy clay loam; moderate, fine, blocky and subangular blocky structure; friable when moist, sticky and plastic when wet; 20 percent chert and sandstone fragments; thick, continuous clay films; pH 5.2; clear, wavy boundary; 7 to 12 inches thick.

B22—27 to 36 inches, red (2.5YR 4/6) cherty sandy clay loam; moderate, fine, blocky structure; friable when moist, sticky and plastic when wet; 25 percent coarse fragments; thin, continuous clay films; pH 5.2; gradual, wavy boundary; 6 to 12 inches thick.

B3—36 to 48 inches, reddish-yellow (7.5YR 6/8) and yellowish-red (5YR 4/8) cherty sandy loam; weak, medium, subangular blocky structure that in places is platy; friable when moist, slightly sticky and slightly plastic when wet; 30 percent coarse fragments; patches of clay film and in places clay bridging; common black films; pH 5.2; gradual, wavy boundary; 8 to 20 inches thick.

C—48 to 60 inches +, strong-brown (7.5YR 5/8) cherty sandy loam; structureless; 40 percent cherty and channery fragments of sandstone; pH 5.4.

The color of the surface soil ranges from yellow to strong brown. In the subsoil the color ranges from 10YR to 10R in hue. The texture of these soils is typically sandy loam, but the range is from loam to sandy clay. The structure of the B horizon is weak to moderate. Coarse fragments in these soils vary greatly in size and amount. The solum ranges from 3 to 5 feet in depth. Depth to hard rock ranges from 4 to 30 feet or more.

MURRILL SERIES

In the Murrill series are deep to very deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed on colluvium that washed or rolled from uplands underlain by sandstone and shale and was deposited on limestone areas at lower elevations. Murrill soils have a finer textured B horizon and lack the fragipan of Laidig soils. Also, the lower part of the solum is generally higher in reaction and base status. These soils are associated with the Hagerstown and Wiltshire soils at lower elevations and with the Laidig and Dekalb soils at higher elevations. The acreage is large, and the soils are important to agriculture in the limestone valleys of Clinton County.

Profile of Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded, in a cornfield in Logan Township near Tylersville (profile S58–Pa–18–19(1–7) sampled for laboratory analysis.

Ap—0 to 10 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, medium, granular structure; friable when moist, sticky when wet; less than 10 percent coarse fragments that are less than 6 inches in diameter; pH 6.4; abrupt, smooth boundary; 9 to 11 inches thick.

B1—10 to 14 inches, yellowish-brown (10YR 5/8) gravelly clay loam; weak, fine and medium, subangular blocky structure; friable when moist, sticky and plastic when wet; 20 to 30 percent coarse fragments; pH 5.0; clear, wavy boundary; 3 to 6 inches thick.

B21—14 to 21 inches, yellowish-brown (10YR 5/6–5/8) gravelly clay loam; weak, medium, subangular blocky structure; firm in place when moist, slightly sticky and plastic when wet; thin, continuous clay films; 30 to 40 percent coarse fragments; 8-inch tongues extending downward; pH 4.7; clear, irregular boundary; 5 to 9 inches thick.

B22—21 to 35 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) gravelly clay loam; weak, medium, subangular blocky structure that is

platy in places; firm in place, friable when disturbed, sticky and plastic when first wet; many manganese films; thick and thin, discontinuous clay films; 25 to 35 percent coarse fragments; pH 4.6; 8-inch tongues extend downward; gradual, irregular boundary; 10 to 18 inches thick.

B23—35 to 44 inches, strong-brown (7.5YR 5/6) gravelly clay loam; a few, fine, distinct streaks of olive (5Y 5/4); weak, fine and medium, subangular blocky structure that is platy in places; firm in place when moist, friable when disturbed, sticky and plastic when first wet; many manganese films; thick and thin, discontinuous clay films; 20 to 30 percent coarse fragments; 6-inch tongues extending downward; pH 4.6; clear, irregular boundary; 6 to 12 inches thick.

B31—44 to 62 inches, brown (7.5YR 5/4) gravelly clay loam; a few, fine, distinct streaks of olive (5Y 5/4); weak, medium, platy structure that breaks to fine, subangular blocky; firm in place when moist, friable when disturbed, sticky and nonplastic when first wet; many manganese films; thick and thin, discontinuous clay films; 20 to 30 percent coarse fragments; 10-inch tongues extend downward; pH 4.8; abrupt, irregular boundary; 14 to 24 inches thick.

B32—62 to 68 inches, strong-brown (7.5YR 5/6) and brownish-yellow (10YR 6/8) gravelly clay loam; mainly massive but weak, medium, platy structure in places; hard when dry, firm in place when moist but friable when disturbed, sticky and plastic when first wet; manganese films common; a few, thin, discontinuous clay films; pH 4.6; 20 to 30 percent coarse fragments.

Profile of Murrill channery silt loam, 8 to 15 percent slopes, in a pasture in Lamar Township, 1 mile west of Mackeyville (profile S58–Pa–18–20(1–7) sampled for laboratory analysis).

Ap—0 to 9 inches, dark-brown (10YR 4/3) channery silt loam; weak, fine to medium, granular structure; friable when moist, nonsticky when wet; 10 percent coarse fragments; pH 7.2; abrupt, wavy boundary; 8 to 11 inches thick.

A3—9 to 15 inches, strong-brown (7.5YR 5/6–5/8) channery silt loam; weak, thin, platy structure that breaks to weak, medium, granular; friable when moist, nonsticky and slightly plastic when wet; 10 percent coarse fragments; pH 6.2; clear, wavy boundary; 5 to 8 inches thick.

B1—15 to 22 inches, yellowish-brown (10YR 5/8) channery clay loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin, continuous clay films; a few manganese films; 10 to 20 percent coarse fragments; 6-inch tongues extend downward; pH 5.2; gradual, irregular boundary; 6 to 12 inches thick.

B21—22 to 36 inches, strong-brown (7.5YR 5/8) channery silty clay loam; weak, fine, subangular blocky structure that is platy in places; firm in place when moist, slightly sticky and plastic when wet; thin, continuous clay films; many, thick manganese films; 10 to 25 percent coarse fragments; 8-inch tongues extend downward; pH 5.3; gradual, irregular boundary; 12 to 18 inches thick.

B22—36 to 52 inches, yellowish-brown (10YR 5/6) channery silty clay loam; many, fine, distinct mottles of dark brown (10YR 4/3) and grayish brown (2.5Y 5/2); weak, medium, subangular blocky structure, but in places polygons and fine plates are evident; firm when moist, sticky and plastic when first wet; thin, continuous clay films; many manganese films; 20 to 30 percent coarse fragments; 8-inch tongues extend downward; pH 5.2; gradual, irregular boundary; 12 to 20 inches thick.

B31—52 to 69 inches, yellowish-brown (10YR 5/6) channery silty clay loam; a few, fine, distinct mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8); weak, medium, platy structure that breaks to weak, medium, subangular blocky, but in a few places polygons are evident; firm in place when moist, friable when disturbed, sticky and plastic when first wet; thin and thick, continuous clay films, a few, thin manganese films; 20 to 30 percent coarse fragments; 8-inch tongues extend downward; pH 5.4; gradual, irregular boundary; 15 to 22 inches thick.

B32—69 to 72 inches +, yellowish-brown (10YR 5/6) channery clay loam; a few, fine, faint mottles of dark brown (10YR 4/4) and light yellowish brown (10YR 6/4); weak, thin, platy structure that breaks to weak, fine, subangular blocky; friable when moist, sticky and plastic when first wet; thin, discontinuous clay films; a few manganese films; 20 to 30 percent coarse fragments; pH 5.5.

The color of the surface soil ranges from yellowish brown to reddish yellow, and that of the subsoil, from yellowish brown to yellowish red. In texture the surface soil is dominantly gravelly loam and silt loam, but in small areas it is gravelly and very stony sandy loam. Coarse fragments in these soils range from less than 5 percent to 40 percent, by volume. In places at a depth below 3 feet, drainage is restricted. The solum ranges from 3 to 6 feet in depth. Depth of noncalcareous material over limestone ranges from 2 to 10 feet or more.

NEWARK SERIES

In the Newark series are somewhat poorly drained soils of the Alluvial great soil group. These soils are forming on flood plains in sediments washed mainly from upland soils underlain by limestone. The Newark soils are heavier textured, better drained, and less acid than the Atkins soils. They are associated with the well-drained Huntington soils, the moderately well drained Lindside soils, and the poorly drained Melvin. Newark soils are subject to overflow in spring. They are generally used for pasture or for cultivated crops.

Typical profile of a Newark silt loam in a cultivated field.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; many roots; pH 6.6; abrupt, smooth boundary; 6 to 10 inches thick.

C1—8 to 13 inches, dark yellowish-brown (10YR 4/4) silt loam; a few, fine, faint mottles of gray (10YR 6/1) and streaks of yellowish brown (10YR 5/6); moderate, thick, platy structure; firm when moist, slightly sticky and plastic when wet; pH 6.6; gradual, wavy boundary; 4 to 6 inches thick.

C2g—13 to 30 inches, dark-brown (10YR 4/3) fine silt loam; many, medium, distinct mottles of gray (10YR 6/1) and streaks of yellowish brown (10YR 5/6); moderate, thick, platy structure; friable to firm when moist, slightly sticky and plastic when wet; pH 6.8; gradual, wavy boundary; 14 to 20 inches thick.

C3g—30 to 48 inches, dark grayish-brown (10YR 4/2) clay loam; many, medium, distinct mottles of dark grayish brown (2.5Y 4/2) and dark gray (5Y 4/1) and a few, fine, prominent streaks of strong brown (7.5YR 5/6); massive but tends to platy; somewhat stratified and contains a few pebbles and cobblestones; pH 7.2; 18 or more inches thick.

Generally the texture of the subsoil is silt loam or clay loam. The color of the B horizon ranges from 7.5YR to 10YR in hue. In places there are lenses of silt and sand. Reaction ranges from pH 6.0 to 7.0 or more. Depth to mottling ranges from 6 to 14 inches.

NOLO SERIES

Soils of the Nolo series are moderately deep to deep, poorly drained to somewhat poorly drained Low-Humic Gleys. These soils developed in material weathered from

sandstone that in places contains interbedded shale. They are associated with the well drained Dekalb soils, the moderately well drained to somewhat poorly drained Cookport soils, and the very poorly drained Lickdale. Nolo soils are coarser textured and more poorly drained than the Cavode soils, and unlike those soils have a distinct fragipan. Their solum is less deep than in the Andover soils, and depth to bedrock is less. Nolo soils are in small areas in depressions and on nearly level, broad flats in the Allegheny Plateau part of the county. They are mostly in forest.

Typical profile of a Nolo silt loam in woodland.

O1—thin cover of litter made up of undecomposed oak and maple leaves.

O2—1 inch or less of matted, decomposed oak and maple leaves; contains many mycelial filaments.

A1—0 to 3 inches, black (N 2/0) silt loam; moderate, very fine, granular structure; friable when moist; pH 4.8; abrupt, wavy boundary; 3 to 4 inches thick.

A2—3 to 6 inches, dark grayish-brown (10YR 4/2) coarse silt loam; very weak, thin, platy and granular structure; friable when moist; pH 4.8; clear, wavy boundary; 3 to 4 inches thick.

B21—6 to 16 inches, light yellowish-brown (10YR 6/4) clay loam; many, medium, distinct mottles of strong brown (7.5YR 5/8) and very pale brown (10YR 7/3); moderate, medium, blocky structure that breaks to weak, thin, platy; friable when moist, sticky and plastic when wet; thin, continuous clay films; pH 4.6; clear, wavy boundary; 8 to 12 inches thick.

B22g—16 to 22 inches, light brownish-gray (10YR 6/2) clay loam; many, medium, distinct mottles of strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4); moderate, very coarse, prismatic structure that breaks to moderate, coarse, blocky; friable to firm when moist, very sticky and plastic when wet; many black films; patches of clay film; pH 4.6; clear, wavy boundary; 5 to 8 inches thick.

Bx1—22 to 30 inches, gray (10YR 6/1) clay loam; many, coarse, distinct mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6); moderate, very coarse, prismatic structure that breaks to moderate, medium, blocky and weak, thin, platy; very firm when moist, very sticky and plastic when wet; 10 percent sandstone fragments; pH 4.4; clear, wavy boundary; 7 to 10 inches thick.

Bx2—30 to 36 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; many, coarse, distinct mottles of gray (10YR 6/1); massive; very firm in place, slightly sticky and plastic when wet; 20 percent channery fragments of sandstone; pH 4.4.

R—36 inches +, gray, partly weathered sandstone.

The texture of the surface soil is dominantly silt loam, but in places it is loam, silt loam, or sandy loam. The color of the surface soil and subsoil are typically 10YR in hue. Coarse fragments in these soils range from less than 5 percent to 20 percent. The fragipan is at a depth of 15 to 24 inches. Depth to mottling ranges from 0 to 10 inches. Bedrock is at a depth of 2½ to 5 feet.

POPE SERIES

In the Pope series are deep, well-drained soils of the Alluvial great soil group. These soils developed on flood plains of streams that drain upland soils underlain by noncalcareous gray sandstone and shale. They are associated with the poorly drained Atkins soils. In contrast to the Barbour soils, Pope soils have a yellowish-brown rather than a reddish-brown subsoil. They are more strongly acid than the Huntington soils and less brown in color. The acreage of the Pope soils is small in Clinton County, and the soils are not important to the agriculture.

Typical profile of Pope loam, fans, 0 to 3 percent slopes, in a cultivated field.

Ap—0 to 10 inches, dark-brown (10YR 4/3) loam; weak, very fine, granular structure; very friable when moist; 10 to 20 percent coarse gravel; pH 6.4; abrupt, wavy boundary; 8 to 11 inches thick.

C1—10 to 40 inches, dark-brown (10YR 4/2) and dark yellowish-brown (10YR 4/4) gravelly silt loam or loam; weak, coarse, prismatic structure that breaks to weak, thin, platy; very friable when moist; 20 to 40 percent coarse gravel; pH 5.4; 30 to 40 inches thick.

C2—40 to 50 inches +, gray pebbles and cobblestones.

The texture of the surface soil is generally loam or stony loam, but in places it is fine sandy loam. Coarse pebbles and cobblestones in these soils range from 10 to 60 percent on the surface and in the subsoil. In places there are lenses of clay and silt, and in a few places the substratum is stratified with layers of sand and gravel.

PURDY SERIES

Purdy soils are poorly drained and very poorly drained Low-Humic Gleys that are intergrading toward Planosols. These soils developed on old stream terraces in noncalcareous, fine-textured silt and clay. They have well-developed horizons, lack a fragipan, and are gleyed. Purdy soils are associated with the somewhat poorly drained Tygart soils. They have a water table at or near the surface in winter and spring but normally are not subject to overflow. The acreage is small, and the areas are near the towns of Beech Creek and Avis.

Typical profile of Purdy silt loam in a cultivated field.

AP—0 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; moderate, fine, granular structure that in places is platy; friable when moist, sticky and slightly plastic when wet; pH 6.2; abrupt, smooth boundary; 8 to 10 inches thick.

B21g—9 to 19 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, very coarse, prismatic structure; the interiors of the prisms have moderate, medium, subangular blocky structure that tends to platy; firm when moist, sticky and plastic when wet; thick, continuous clay films; 5 percent gravel; pH 5.6; clear, smooth boundary; 7 to 12 inches thick.

B22g—19 to 34 inches, gray (5Y 6/1) silty clay; many, medium, prominent mottles of yellowish brown (10YR 5/6); moderate, very coarse, prismatic structure that in the interiors of the prisms breaks to moderate, medium, blocky and weak, thin, platy; firm when moist, sticky and plastic when wet; 5 percent gravel; thick, continuous clay films; pH 4.8; clear, wavy boundary; 12 to 20 inches thick.

C—34 inches +, gray (10YR 5/1) gravelly silty clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); massive to somewhat platy structure; firm when moist, sticky and plastic when wet; 40 percent fine gravel; pH 4.6.

Generally the texture of the surface soil is silt loam, and that of the subsoil is silty clay. The content of gravel ranges from less than 5 percent in the surface soil to 40 percent or more in the C horizon. Depth of the solum ranges from 2 to 3 feet.

SEQUATCHIE SERIES

In the Sequatchie series are deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Alluvial soils. These soils developed in sediments washed mainly from upland soils underlain by noncalcareous sandstone and shale. They are on low stream terraces that are above flood level. Sequatchie soils are similar to the

Ashton soils, but they have a redder subsoil and are more acid. They are associated with the moderately well drained to somewhat poorly drained Whitwell soils. The acreage of Sequatchie soils is small, but the soils are fertile and are easy to manage.

Typical profile of Sequatchie loam in a cultivated field.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) loam and fine sandy loam; weak, fine, granular structure; friable when moist; less than 5 percent fine gravel; many roots; pH 4.8; abrupt, smooth boundary; 9 to 11 inches thick.

B1—10 to 15 inches, brown (7.5YR 5/4) silt loam and fine sandy loam; weak, fine, subangular blocky structure that in places is weak, platy; friable when moist, nonsticky and nonplastic when wet; roots are common; pH 5.0; clear, wavy boundary; 4 to 6 inches thick.

B21—15 to 22 inches, brown (7.5YR 4/4) fine sandy clay loam; weak, medium, prismatic structure that breaks to moderate, coarse, subangular blocky; friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; a few roots; pH 5.2; gradual, wavy boundary; 6 to 10 inches thick.

B22—22 to 31 inches, reddish-brown (5YR 4/4) sandy loam; weak, medium, prismatic structure that breaks to moderate, coarse, subangular blocky; firm when moist, nonsticky and nonplastic when wet; thin, continuous clay films; a few roots to a depth of 28 inches; pH 5.2; clear, wavy boundary; 8 to 11 inches thick.

B3—31 to 35 inches, dark-brown (7.5YR 4/4) loamy sand; weak, medium, platy structure; loose when moist; 20 to 25 percent fine gravel; pH 5.2; clear, wavy boundary.

C—35 inches +, dark-brown (7.5YR 4/4) gravelly sand; structureless; loose when moist; 80 to 90 percent gravel.

The texture of the surface soil is fine sandy loam, silt loam, sandy loam, or loam. The color of the B horizon typically is 7.5YR and 5YR in hue, but it ranges to 2.5YR. Depth to gravel ranges from 2½ to 5 feet.

TYGART SERIES

The Tygart series consists of somewhat poorly drained to moderately well drained Red-Yellow Podzolic soils that are intergrading toward Planosols. These soils developed in noncalcareous, slack-water sediments of clay and silt washed from upland soils underlain by shale and sandstone. They are on stream terraces that are well above the flood level, near the towns of Beech Creek and Avis. Tygart soils are near the poorly drained to very poorly drained Purdy soils. They are finer textured than other soils on terraces and flood plains, except the Purdy soils, and are almost free of stones.

Typical profile of Tygart silt loam in a cultivated field.

Ap—0 to 8 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure that in places is platy; friable when moist; many roots; pH 5.0; abrupt, smooth boundary; 7 to 9 inches thick.

B1—8 to 15 inches, light yellowish-brown (2.5Y 6/4) silty clay loam; weak, medium, subangular blocky structure; friable when moist, sticky and plastic when wet; common to few roots; pH 5.0; clear, wavy boundary; 6 to 8 inches thick.

B2—15 to 28 inches, strong-brown (7.5YR 5/6) silty clay; many, medium, prominent mottles of gray (5Y 6/1); weak, fine to medium, subangular blocky structure; slightly firm when moist, sticky and plastic when wet; thick, continuous clay films; pH 4.8; abrupt, wavy boundary; 8 to 10 inches thick.

Cg—28 to 36 inches, gray (N 5/0) fine gravelly silty clay; many, large, prominent mottles of strong brown (7.5YR 5/6); massive; firm when moist, sticky and plastic when wet; 40 percent fine gravel; pH 4.6.

The texture of the surface soil is silt loam, and that of the B horizon is silty clay loam and silty clay. Depth of the solum ranges from 2 to 4 feet.

UNGERS SERIES

In the Ungers series are moderately deep to deep, well-drained Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. These soils developed in medium-textured material weathered from acid red shale, from siltstone, and from red sandstone that is fine grained. They are on rolling upland plateaus in both the Allegheny Plateau and the Ridge and Valley province. In many places the Ungers soils are near the Dekalb, Hartsells, and Lehew soils. Ungers soils are coarser textured than the Meckesville soils and are less deep to hard rock. They are deeper than the Lehew soils and have a more distinct B horizon. The acreage is small.

Typical profile of Ungers loam, 3 to 8 percent slopes, in woodland.

O1—2 inches to 1 inch of forest litter that is mainly dried oak leaves but includes maple and cherry leaves.

O2—1 inch or less of dark-brown (7.5YR 3/2) decomposed leaves, twigs, and fine roots matted with fine roots; pH 4.5; ½ to 2 inches thick.

A1—0 to 2 inches, black (10YR 2/1) loam; weak, medium, granular structure; very friable when moist; many roots; pH 4.0; abrupt, wavy boundary; 1 to 3 inches thick.

A2—2 to 6 inches, dark-brown (7.5YR 4/4) loam; weak, very fine to fine, granular structure; very friable when moist; less than 5 percent coarse fragments; pH 4.6; clear, wavy boundary; 3 to 5 inches thick.

A3—6 to 11 inches, reddish-brown (5YR 4/3) loam; weak, thin, platy and weak, fine, granular structure; very friable when moist, slightly sticky and slightly plastic when wet; less than 5 percent coarse fragments; pH 4.8; gradual, wavy boundary; 4 to 7 inches thick.

B21—11 to 16 inches, reddish-brown (5YR 4/3 to 4/4) silt loam; moderate, fine, subangular blocky structure; friable when moist, slightly sticky when wet; 5 percent coarse fragments; thin, discontinuous clay films; pH 4.6; gradual, wavy boundary; 4 to 7 inches thick.

B22—16 to 24 inches, reddish-brown (5YR 4/3 to 4/4) silt loam; weak, fine to medium, subangular blocky structure; friable when moist, slightly sticky when wet; 5 percent coarse fragments; thin, discontinuous clay films; pH 4.6; gradual, wavy boundary; 7 to 10 inches thick.

B3—24 to 34 inches, reddish-brown (5YR 4/3) sandy loam; weak, thick, platy structure that breaks to weak, fine, subangular blocky; slightly firm in place; 10 to 15 percent coarse fragments; pH 4.8; clear, wavy boundary; 7 to 12 inches thick.

C—34 to 38 inches, reddish-brown (5YR 4/4) channery sandy loam; massive; firm in place; 30 to 40 percent coarse fragments; pH 4.8.

The texture of the surface layer is dominantly loam, but it is silt loam and sandy loam in many places. The color of the subsoil is typically 5YR in hue, but in places it is 7.5YR and 2.5YR in hue. In a few places the subsoil is sandy clay loam. Coarse fragments in these soils range from 2 to 20 percent, by volume. Depth of the solum ranges from 2½ to 3 feet.

UPSHUR SERIES

In the Upshur series are deep, well-drained Gray-Brown Podzolic soils developed on material from acid, red clay shale, mainly of the Mauch Chunk formation. These soils are finer textured than the Lehew soils and have a more distinct textural B horizon. They are also

deeper and have fewer coarse fragments. The acreage is small, and most areas are in woodland.

Typical profile of Upshur silt loam, acid substratum, 2 to 8 percent slopes, in an abandoned field.

Ap—0 to 7 inches, reddish-brown (5YR 5/3) silt loam; weak, fine, granular structure; friable to very friable when moist; many fine roots; pH 5.0; clear, smooth boundary; 6 to 8 inches thick.

A3—7 to 13 inches, reddish-brown (2.5YR 4/4) silt loam; weak, fine and medium, subangular blocky and weak, fine, granular structure; friable when moist; pH 5.2; clear, wavy boundary; 5 to 7 inches thick.

B2—13 to 22 inches, dark-red (2.5YR 3/6) silty clay; strong, medium and coarse, blocky structure; firm when moist, slightly sticky and plastic when wet; prominent, continuous clay films; pH 5.2; gradual, wavy boundary; 9 to 12 inches thick.

B3—22 to 32 inches, dark-red (2.5YR 3/6) silty clay; strong, medium and coarse, blocky structure; firm when moist, slightly sticky and plastic when wet; thick clay films; pH 5.2; gradual, wavy boundary; 9 to 12 inches thick.

C—32 to 36 inches +, weathered clay shale that is dominantly dark red but has streaks and mottles of olive gray and black; a few fragments of fine-grained sandstone.

In the north-central part of the county, the texture of the surface soil is commonly silty clay loam. The texture of the B horizon ranges from silty clay loam to silty clay. Depth of the solum ranges from 2½ to 3½ feet. The soil described is underlain by strongly acid to very strongly acid material, but normally Upshur soils are underlain by parent material that contains some carbonates and is nearly neutral in reaction.

WATSON SERIES

In the Watson series are deep, moderately well drained Red-Yellow Podzolic soils. Generally these soils developed in glacial till or in periglacial and colluvial deposits in a mixture of material from gray shale, siltstone, and sandstone. They are gently sloping and occupy areas where seep water from higher slopes collects in wet periods. The solum is generally more than 30 inches thick and has a fragipan. The subsoil is mottled and has an increase in clay.

Watson soils are associated with the well-drained Allenwood soils and the moderately well drained Comly. They are also associated with the poorly drained Brinkerton soils and the very poorly drained Lickdale. Watson soils are more silty and less sandy than the Buchanan soils and have a less strongly expressed fragipan. They are redder than the Comly soils. The acreage is small and is mostly in crops.

Typical profile of Watson silt loam, 0 to 5 percent slopes, in a cultivated field.

Ap—0 to 10 inches, dark yellowish-brown (10YR 3/4) silt loam; weak, fine and medium, granular structure; friable when moist; many roots; pH 5.8; clear, wavy boundary; 8 to 11 inches thick.

B1—10 to 16 inches, reddish-brown (5YR 4/4) silty clay loam that in a few places is light reddish brown (5YR 5/3); weak, thin, platy structure that breaks to weak, medium, subangular blocky; friable when moist, sticky and plastic when wet; thin, continuous clay films; 2 percent of pebbles that are as much as 2 inches in diameter; moderate number of roots; pH 5.0; clear, wavy boundary; 4 to 7 inches thick.

B21—16 to 20 inches, brown (7.5YR 4/4) silty clay loam; a few, fine, faint mottles of strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2); moderate, fine, subangular blocky structure that in places is platy; friable when moist, sticky and plastic when wet; thin, continuous clay films; 5 percent of pebbles that are as much as 2 inches in diameter; a few roots; pH 4.8; abrupt, wavy boundary; 3 to 5 inches thick.

B22—20 to 29 inches, reddish-brown (5YR 4/4) clay loam; many, fine, distinct mottles of light reddish brown (5YR 6/3) and light gray (5YR 7/1); moderate, medium, subangular blocky structure that breaks to weak, thin, platy; reddish-brown (5YR 5/3) clay films; firm when moist, sticky and plastic when wet; thick, continuous clay films; 5 percent of pebbles that are as much as 2 inches in diameter; pH 4.4; clear, wavy boundary; 7 to 10 inches thick.

Bx—29 to 36 inches, strong-brown (7.5YR 5/6) clay loam; a few, fine, distinct mottles of light gray (10YR 6/1) and reddish brown (2.5YR 4/4); weak, very coarse, prismatic structure that breaks to moderate, medium, platy; firm in place, sticky and slightly plastic when wet; thin, discontinuous clay films; 10 to 15 percent of layer is fine pebbles as much as 2 inches in diameter; pH 4.7.

The texture of the surface soil is silt loam, gravelly loam, loam, or gravelly silt loam. Coarse fragments in the soils range from 2 to 40 percent. The color typically is 7.5YR in hue but ranges from 5YR to 10YR. Texture of the B horizon ranges from clay loam to silty clay loam. Depth to the fragipan ranges from 25 to 35 inches. Depth of the solum ranges from 30 to 60 inches.

WHITWELL SERIES

The Whitwell series consists of moderately well drained to somewhat poorly drained Gray-Brown Podzolic soils that are intergrading toward Alluvial soils. These soils formed on low stream terraces in a mixture of sediments from sandstone, siltstone, shale, and glacial till. They are near the well-drained Sequatchie soils, but unlike those soils, Whitwell soils are mottled in the lower part of the solum. Sequatchie soils are coarser textured than are the Whitwell soils and are browner. Whitwell soils are seldom flooded. Their acreage is small.

Typical profile of Whitwell silt loam, 0 to 5 percent slopes, moderately eroded, in a cultivated field.

Ap—0 to 9 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable when moist; a few small pebbles; many roots; pH 6.0; abrupt, smooth boundary; 8 to 10 inches thick.

B1—9 to 14 inches, strong-brown (7.5YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable when moist; many roots; a few small pebbles; pH 4.8; clear, smooth boundary; 4 to 6 inches thick.

B21—14 to 20 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm when moist; thin, continuous clay films; 5 percent gravel; pH 4.8; clear, smooth boundary; 5 to 8 inches thick.

B22—20 to 38 inches, yellowish-red (5YR 4/8) clay loam; common, medium, distinct mottles of brown (7.5YR 5/4); moderate, medium, blocky structure; firm when moist; thin clay films; 10 percent gravel; pH 4.8; clear, smooth boundary; 14 to 20 inches thick.

C—38 inches +, yellowish-red (5YR 5/6) and reddish-yellow (5YR 6/8) gravelly and cobbly sandy loam that is weakly stratified in places; structureless; 25 to 50 percent coarse fragments; pH 5.0.

The surface soil is commonly silt loam, fine sandy loam, or loam in texture. Its color ranges from dark brown to strong brown. The color of the B horizon ranges from yellowish brown to yellowish red. Depth to mottling ranges from 12 to 30 inches.

WILTSHIRE SERIES

In the Wiltshire series are deep, moderately well drained Gray-Brown Podzolic soils that are intergrading toward

Red-Yellow Podzolic soils. These soils developed in colluvium and alluvium weathered from gray limestone and from calcareous shale that is mixed with acid to neutral, brown shale. They are on the bottoms of broad sinks, at the base of slopes, and on flood plains along intermittent streams that drain limestone areas. Wiltshire soils are higher in reaction and are finer textured than the Buchanan soils. They also contain considerably fewer sandstone and shale fragments. The acreage is small, and the soils have slight importance agriculturally.

Profile of Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded, in a field of rotation hay in Lamar Township, 1 mile west of Rote on Route 18030 (profile S58–Pa–18–3(1–10) sampled for laboratory analysis).

Ap—0 to 7 inches, dark-brown (10YR 4/2) silt loam; weak to medium, fine, granular structure; friable when moist; pH 7.2 (limed); abrupt, smooth boundary; 6 to 8 inches thick.

A2—7 to 11 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable when moist; thin, discontinuous clay films; pH 7.0 (limed); clear, wavy boundary; 3 to 5 inches thick.

B21—11 to 15 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate to strong, medium, subangular blocky structure; friable when moist; thin, discontinuous clay films; pH 6.8; clear, wavy boundary; 2 to 6 inches thick.

B22—15 to 23 inches, yellowish-brown (10YR 5/6) clay loam; weak to moderate, medium, subangular blocky structure; friable when moist; pH 4.8; abrupt, wavy boundary; 4 to 8 inches thick.

IIBx1—23 to 34 inches, strong-brown (7.5YR 5/8) coarse sandy clay loam; common, fine, distinct mottles of dark brown (7.5YR 4/4) and brown (7.5YR 5/4); moderate, medium, subangular blocky structure; firm when moist; much fine gravel; pH 4.8; abrupt, wavy boundary; 10 to 12 inches thick.

IIBx2—34 to 39 inches, strong-brown (7.5YR 5/6) clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2), pale brown (10YR 6/3), and olive brown (2.5Y 4/6); weak, coarse, subangular blocky structure; firm in place; thin, continuous clay films; pH 5.1; clear, wavy boundary; 4 to 6 inches thick.

IIIBx1—39 to 48 inches, dark yellowish-brown (10YR 4/4) silty clay loam; a few, fine, distinct mottles of yellowish red (5YR 4/6); massive but tends toward layering in places; pH 4.9; clear, wavy boundary; 9 to 13 inches thick.

IIIBx2—48 to 53 inches, strong-brown (7.5YR 5/8) silty clay loam; massive; firm in place; a few fine pebbles; pH 5.4; clear, wavy boundary; 5 to 8 inches thick.

IVC—53 to 61 inches, dark yellowish-brown (10YR 4/4) loam; weak, coarse, subangular blocky structure; friable when moist; pH 5.5; abrupt, wavy boundary; 3 to 10 inches thick.

VC—61 to 68 inches, reddish-brown (5YR 4/4) clay; very weak, very fine, subangular blocky structure that in places tends to coarse, blocky; friable when moist; pH 5.8.

Profile of Wiltshire silt loam, 0 to 3 percent slopes, in a field of rotation hay, in Porter Township, 1.3 miles northwest of Clintondale on Route T324 (profile S58–Pa–18–8(1–8) sampled for laboratory analysis).

Ap—0 to 6 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable when moist; pH 7.0 (limed); abrupt, smooth boundary; 5 to 7 inches thick.

A2—6 to 10 inches, brown (7.5YR 5/4 and 10YR 5/3) silt loam; in places dark-brown (10YR 4/3) coatings on peds; weak, fine to medium, subangular blocky structure; friable when moist; pH 7.1 (limed); clear, irregular boundary; 2 to 8 inches thick.

B21—10 to 19 inches, strong-brown (7.5YR 5/6) silty clay loam; weak to moderate, fine, subangular blocky structure that in places is platy; friable when moist; channels between larger peds filled with surface soil; pH 6.6; clear, irregular boundary; 6 to 12 inches thick.

B22—19 to 24 inches, dark-brown (7.5YR 4/4) silty clay loam; a few, fine, faint mottles of strong brown (7.5YR 5/6); weak to moderate, fine, subangular blocky structure; friable when moist; thin, continuous clay films; many pores; pH 6.3; clear, irregular boundary; 3 to 8 inches thick.

B23—24 to 30 inches, reddish-brown (5YR 5/4) clay loam; common, fine, distinct mottles of reddish gray (5YR 5/2) and yellowish red (5YR 5/6); weak to moderate, fine, subangular blocky structure; slightly sticky when wet; thin, continuous clay films but thinner than in the B22 horizon; many black films and black concretions; pH 5.7; abrupt, irregular boundary; 4 to 8 inches thick.

Bx1—30 to 36 inches, yellowish-red (5YR 5/6) clay loam; common, fine, black coatings and concretions; massive; very firm in place; many pores ½ millimeter in diameter; pH 5.8; abrupt, irregular boundary; 4 to 10 inches thick.

Bx2—36 to 42 inches, strong-brown (7.5YR 5/8) silty clay loam with brown (7.5YR 5/4) ped surfaces; weak, medium, blocky structure that in places is platy; firm in place; thick clay films and common manganese coatings; pH 5.9; clear, irregular boundary; 4 to 9 inches thick.

Bx3—42 inches +, yellowish-red (5YR 5/6) clay loam; common, fine, reddish-yellow mottles; weak, medium, platy structure that tends toward massive; firm when moist; common, fine, black and red concretions and partial, thin clay films; pH 6.0.

Generally the texture of the surface soil is silt loam. The texture of the horizons below the surface soil ranges from silt loam to clay loam. The thickness of the horizons ranges from 2 to 15 inches, but in places some of the horizons in the soil described are lacking. The color of the surface soil and of the upper part of the B horizon ranges between 7.5YR and 10YR in hue. They have a value of 5 and a high chroma. The color in the lower part of the B horizon is typically 7.5YR in hue but ranges to 5YR and 10YR in hue. Reaction of the lower part of the solum ranges from slightly acid to strongly acid. The pH of the surface soil depends upon liming practices. The solum ranges from 3 to 4 feet in depth. Depth to hard rock ranges from 4 to 8 feet.

Laboratory Data

The physical and chemical properties of selected soils in Clinton County are shown in tables 9 and 10. The series sampled are Andover, Ashton, Buchanan, Dekalb, Hagerstown, Laidig, Meckesville, Murrill, and Wiltshire.

Two sites were selected for each series except for the Dekalb, which was sampled at four sites. Typical profiles were located in areas that were most nearly representative in slope, erosion, stoniness, and dominant land use. Samples were collected from each horizon that could be recognized in a pit dug through the solum and into the parent material. Four-quart samples were collected from each horizon. Selected horizons of these profiles were also sampled for engineering tests made by the Soil Testing Laboratory of the Pennsylvania Department of

[6] Laboratory analyses were made at the Soil Characterization Laboratory of the Pennsylvania State University by R. P. Matelski, C. F. Engle, E. C. Mason, and staff.

TABLE 9.—*Physical*

Soil name, sample number, and location of sample site	Horizon	Depth	Particle-size distribution			
			Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*
Andover very stony loam; S58–Pa–18–12(1–5); 13 miles SW. of Lock Haven.	A1	0–5	0.4	1.6	5.7	18.4
	A2	5–8	3.9	4.2	6.5	19.8
	B2	8–14	1.3	1.5	5.1	24.9
	Bx1	14–21	4.1	4.4	10.2	29.5
	Bx2	21–45	11.5	7.7	12.7	28.4
Andover very stony loam; S58–Pa–18–13(1–6); 4.5 miles SE. of Lock Haven.	Ap	0–9	2.4	2.4	6.0	10.0
	A2	9–14	2.1	3.4	7.7	11.4
	B21	14–18	2.5	2.6	7.1	11.4
	B22	18–27	3.3	3.8	7.2	9.4
	Bx1	27–32	3.6	3.4	5.8	8.5
	Bx2	32–38	6.5	5.8	9.0	11.1
Ashton silt loam; S58–Pa–18–1(1–8); 1 mile E. of Lock Haven.	Ap	0–14	.1	.2	.4	3.4
	B1	14–22	.1	.3	1.5	6.2
	B21	22–34	.1	.3	1.4	7.5
	B22	34–40	.1	.2	1.2	7.5
	B31	40–48	.1	.2	1.0	8.7
	B32	48–54	.1	.1	1.4	17.0
	C1	54–65	.1	.3	10.2	43.1
	C2	65–72	.1	.2	6.8	34.4
Ashton silt loam; S58–Pa–18–2(1–8); 3½ miles E. of Lock Haven.	Ap	0–9	.1	.2	.5	16.6
	B1	9–13	.1	.2	.7	7.3
	B21	13–22	.1	.2	.8	6.2
	B22	22–30	.1	.1	.4	3.3
	B23	30–39	.1	.2	.4	2.5
	B3	39–48	.1	.1	.6	6.0
	C1	48–60	.1	.1	.8	30.5
	C2	60–66	.1	.1	1.7	32.0
Buchanan gravelly loam; S58–Pa–18–11(1–7); 1.5 miles E. of Carroll on Route 880.	Ap	0–12	6.6	5.1	8.8	11.3
	B1	12–17	14.0	6.4	7.7	9.2
	B21	17–21	14.2	7.7	7.6	8.1
	B22	21–27	12.9	8.0	8.6	9.7
	Bx1	27–32	10.4	7.4	10.4	11.5
	Bx2	32–41	10.4	7.0	8.7	9.6
	Bx3	41–57	11.6	8.3	11.2	11.2
Buchanan gravelly loam; S58–Pa–18–15(1–8); 4.0 miles SE. of Mill Hall to Rote.	Ap	0–7	4.4	4.9	7.0	7.6
	A2	7–9	4.0	4.5	4.8	6.0
	B1	9–14	4.0	5.4	5.2	5.7
	B21	14–20	5.6	7.0	6.8	7.4
	B22	20–26	3.9	5.4	7.4	8.0
	Bx1	26–31	4.1	5.8	7.2	9.1
	Bx2	31–38	6.8	8.2	8.2	21.6
	Bx3	38–47	8.2	9.4	10.7	10.1
Dekalb very stony sandy loam; S58–Pa–18–4(1–6); 10½ miles S. of Lock Haven on Route 880.	O2	1–0				
	A1	0–2				
	A21	2–3				
	A22	3–10	3.0	2.9	9.1	24.0
	B21	10–21	3.4	3.3	11.5	33.9
	B22	21–35	3.8	3.8	11.6	25.5
	C	35–52	5.5	4.4	13.1	34.9
Dekalb very stony sandy loam; S58–Pa–18–5 (1–6); 2 miles E. of McElhattan on Route 880.	O1	2–1				
	O2	1–0	1.5	1.9	26.1	28.9
	A2	0–2	1.3	2.0	20.7	21.9
	A3	2–7	3.5	2.7	15.9	19.2
	B21	7–16	6.7	6.1	19.2	17.1
	B22	16–28	7.7	7.0	21.9	22.5
	C1	28–38	8.0	7.2	22.1	21.1

properties of selected soils

Particle-size distribution—Con.			Coarse fragments (greater than 2 mm.)	Textural class	Bulk density	Moisture held at tension of—	
Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)				⅓ atmosphere	15 atmospheres
Percent	*Percent*	*Percent*	*Percentage by weight*		*Gm./cc.*	*Percent*	*Percent*
8.0	38.4	27.5	4.6	Clay loam to loam			21.5
8.6	34.4	22.6	9.6	Loam			11.8
11.2	37.4	18.6	6.6	Loam			8.3
11.5	26.0	14.3	32.6	Fine sandy loam			8.1
10.2	19.2	10.3	32.6	Sandy loam			6.2
8.8	46.6	23.8	12.0	Loam	1.24	29.8	14.0
9.8	46.4	19.2	50.0	Loam	1.48	27.1	9.6
9.9	42.4	24.1	38.8	Loam	1.61	21.5	11.7
8.0	40.4	27.9	48.7	Clay loam			13.4
7.3	46.6	24.8	40.5	Loam			12.0
8.6	39.5	19.5	38.7	Loam			10.7
14.1	58.7	23.1	1.0	Silt loam	1.24	29.8	11.5
9.2	61.2	21.5	.0	Silt loam	1.37	25.0	11.5
15.0	50.2	25.5	1.2	Silt loam	1.55	22.7	13.4
18.2	50.1	22.7	.0	Silt loam	1.55	23.8	12.3
25.7	48.2	16.1	2.4	Loam	1.60	20.4	8.8
26.1	42.0	13.3	.0	Loam	1.58	20.0	7.7
19.0	19.5	7.8	.0	Fine sandy loam	1.55	15.2	5.4
24.5	27.5	6.5	1.0	Fine sandy loam			5.5
31.6	40.4	10.6	1.1	Loam	1.42	21.1	6.4
23.6	50.8	17.3	.0	Silt loam	1.46	21.2	9.2
20.9	50.1	21.7	.0	Silt loam	1.53	21.4	11.5
16.1	56.1	23.9	.0	Silt loam	1.50	22.1	12.0
15.3	60.2	21.3	.0	Silt loam	1.54	23.4	10.7
24.5	53.8	14.9	.0	Silt loam	1.59	21.2	8.2
34.6	26.6	7.3	.0	Very fine sandy loam	1.55	20.4	5.3
32.0	26.5	7.6	.4	Very fine sandy loam			5.5
8.3	42.1	17.8	36.1	Loam	1.43	19.9	9.2
6.8	38.9	17.0	30.4	Loam	1.60	17.7	19.3
6.7	36.7	19.0	39.4	Loam	1.72	15.9	11.0
6.9	36.9	17.0	37.7	Loam	1.71	16.9	9.8
8.2	34.2	17.9	29.4	Loam	1.66	18.1	9.2
6.5	39.0	18.8	34.7	Loam	1.68	17.3	9.8
7.4	33.7	16.6	42.1	Loam	1.69	19.5	9.3
5.4	54.8	15.9	19.0	Silt loam	1.40	23.2	10.1
4.2	49.8	26.7	13.4	Loam and silt loam	1.56	19.5	11.4
4.4	46.4	28.9	18.0	Clay loam	1.53	19.2	12.8
4.4	38.6	30.2	43.4	Clay loam	1.56	17.5	13.6
5.1	37.8	32.4	60.5	Clay loam			14.0
5.2	47.8	20.8	59.8	Loam			13.0
5.7	28.3	21.2	62.3	Loam			11.7
5.7	35.3	20.6	60.6	Loam			11.4
			15.6				6.6
			40.9				6.0
13.0	38.8	9.2	41.9	Fine sandy loam			6.3
12.7	26.8	8.4	33.3	Fine sandy loam			4.0
13.3	34.4	7.6	42.4	Fine sandy loam			6.5
12.5	20.4	9.2	33.2	Fine sandy loam			3.6
8.8	28.4	4.4	22.6	Fine sandy loam			7.4
7.6	36.2	10.3	3.9	Fine sandy loam			5.9
6.6	37.4	14.7	37.1	Loam			7.6
5.6	31.4	13.9	27.2	Sandy loam			7.1
6.8	25.1	9.0	32.7	Sandy loam			4.6
5.7	24.9	11.0	41.6	Sandy loam			4.3

TABLE 9.—*Physical*

Soil name, sample number, and location of sample site	Horizon	Depth	Particle-size distribution			
			Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*
Dekalb very stony sandy loam; S58-Pa-18-6 (1-6); 6 miles N. of Lock Haven in State Game Lands No. 89.	O1	1-0				
	A1	0-2	3.5	10.6	25.5	14.9
	A22	2-7	5.2	9.7	20.4	12.5
	B1	7-11	7.6	11.0	19.3	11.6
	B2	11-20	10.8	12.2	18.0	10.0
	B3	20-29	10.0	12.3	17.4	10.8
	C	29-34	8.4	14.0	19.9	11.2
Dekalb very stony sandy loam; S58-Pa-18-7 (1-6); 7½ miles N. of Lock Haven.	O2	1-0				
	Bir	0-2	1.6	1.4	29.4	9.4
	A'2	2-8	3.5	2.4	25.0	22.4
	B'1	8-13	5.8	3.0	21.2	21.2
	B'2	13-23	4.8	3.6	23.8	20.8
	C1	23-32	.7	2.5	39.6	25.4
	C2	32+				
Hagerstown silt loam; S58-Pa-18-9(1-7); 7 miles SW. of Mill Hall on Route 64.	Ap	0-7	1.9	2.2	1.6	5.3
	B21	7-10	.7	1.1	.9	1.2
	B22	10-15	.4	.6	.6	.8
	B23	15-21	.6	.6	.6	.9
	B24	21-28	1.0	.8	.6	1.0
	B3	28-32	1.9	1.5	.8	1.1
	C	32+	2.0	1.3	.9	1.3
Hagerstown silt loam; S58-Pa-18-10 (1-8); 4.5 miles SW. of Mill Hall on Route 64.	Ap	0-6	3.3	2.6	1.7	2.3
	A2	6-11	2.3	2.0	1.1	1.5
	B1	11-16	1.5	1.4	1.0	1.3
	B21	16-21	1.8	1.5	1.2	1.5
	B22	21-28	1.3	1.5	1.0	1.4
	B23	28-34	1.1	.7	.8	1.1
	B31	34-44	1.4	1.2	1.0	1.1
	B32	44-54	1.1	1.2	.7	.7
Laidig very stony loam; S59-Pa-18-17(1-9); on State Forest Land, 0.6 mile W. of boundary line between Clinton County and Union County at Tea Springs.	O1	(1)				
	O2	2-0				
	A1	0-1	1.8	2.4	22.4	16.8
	A3	1-6	1.7	1.8	19.1	10.6
	B1	6-10	2.6	2.2	17.9	12.7
	B21	10-22	3.3	2.4	21.0	11.1
	B22	22-31	3.1	3.2	18.5	10.9
	B23	31-43	3.2	3.2	24.5	13.6
	Bx	43-60	3.5	3.1	19.8	15.6
	C	60-72	3.4	3.5	20.4	12.7
Laidig very stony loam; S59-Pa-18-18(1-10); 2.6 miles W. of boundary line between Clinton County and Union County.	O1	3-2				
	O2	2-0				
	A1	0-4	1.4	1.4	9.6	9.0
	A3	4-9	1.8	1.9	9.8	8.3
	B1	9-15	2.6	2.9	8.6	9.3
	B21	15-25	4.0	4.0	14.9	11.2
	B22	25-33	3.7	3.8	10.3	6.6
	B23	33-46	2.9	3.6	8.3	5.3
	B24	46-55	4.4	5.3	5.7	2.6
	Bx1	55-63	7.1	8.0	6.7	2.7
	Bx2	63-70+	5.0	5.7	4.6	1.6
Meckesville silt loam; S58-Pa-18-14(1-7); 1 mile N. of Lock Haven on U.S. Route 120.	Ap	0-8	.7	1.6	3.9	9.5
	A3	8-12	2.0	3.7	5.3	10.7
	B1	12-17	1.3	2.8	6.0	11.0
	B21	17-23	1.0	5.2	6.3	11.4
	B22	23-29	1.2	2.6	5.1	10.2
	B31	29-38	4.0	5.3	6.5	10.5
	B32	38-47+	.6	1.5	4.4	8.8

[1] Trace.

properties of selected soils—Continued

Particle-size distribution—Con.			Coarse fragments (greater than 2 mm.)	Textural class	Bulk density	Moisture held at tension of—	
Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)				⅓ atmosphere	15 atmospheres
Percent	*Percent*	*Percent*	*Percentage by weight*		*Gm./cc.*	*Percent*	*Percent*
7.3	31.1	7.1	10.2	Sandy loam			14.3
5.5	37.1	9.6	23.5	Sandy loam			5.4
5.3	35.4	9.8	19.0	Sandy loam			4.9
4.7	34.1	10.2	22.6	Sandy loam			6.5
4.9	30.6	14.0	22.8	Sandy loam			6.4
5.1	29.0	12.4	25.5	Sandy loam			5.2
			19.3				69.5
9.4	28.6	4.8	5.8	Fine sandy loam and sandy loam			3.9
8.4	31.0	7.3	26.0	Sandy loam			3.8
7.8	31.5	9.5	20.7	Sandy loam			5.1
8.0	25.4	13.6	24.0	Sandy loam			6.5
7.8	15.5	8.5	13.3	Sandy loam			4.4
4.8	62.5	21.7	5.0	Silt loam	1.38	23.4	8.1
2.1	36.0	58.0	36.0	Clay	1.45	25.8	18.6
1.2	19.4	77.0	28.8	Clay	1.32	34.4	25.2
2.2	19.2	75.9	33.3	Clay	1.30	37.9	25.7
3.9	27.9	64.8	26.9	Clay	1.27	29.5	22.8
3.8	29.3	61.6	21.1	Clay	1.24	31.9	22.3
3.5	27.1	63.9	31.0	Clay			21.9
9.4	64.1	16.6	10.9	Silt loam	1.37	23.6	7.2
5.1	57.4	30.6	15.0	Silty clay loam	1.50	18.6	11.3
4.8	51.8	38.2	37.6	Silty clay loam	1.59	20.2	14.1
5.5	51.1	37.4	16.4	Silty clay loam	1.56	20.1	13.8
6.6	56.0	32.2	8.7	Silty clay loam	1.62	19.5	11.1
7.4	48.1	40.8	19.6	Silty clay	1.66	19.1	12.7
6.6	40.6	48.1	26.5	Silty clay	1.48	23.1	15.2
2.9	40.8	52.6	24.2	Silty clay	1.53	16.8	17.8
15.7	28.5	12.4	53.5	Fine sandy loam			4.1
12.2	37.5	17.1	43.7	Loam			9.0
11.5	36.1	17.0	44.7	Loam			8.2
11.6	35.9	14.7	44.8	Loam			7.0
11.1	37.4	15.8	52.0	Loam			7.5
16.2	26.6	12.7	54.6	Sandy loam			4.6
14.9	29.9	13.2	42.8	Fine sandy loam			6.1
15.8	31.9	12.3	45.0	Fine sandy loam			5.7
14.5	48.5	15.6	42.8	Loam and silt loam			8.4
14.1	48.4	15.7	34.7	Loam			8.0
13.0	43.7	19.9	33.0	Loam			9.2
13.2	33.1	19.6	37.0	Loam			9.1
8.9	35.7	31.0	29.7	Clay loam			13.5
7.0	37.0	35.9	13.5	Clay loam			16.3
4.9	42.0	35.1	40.5	Clay loam			17.0
3.4	39.4	32.7	56.5	Clay loam			17.2
2.5	44.1	36.5	51.0	Silty clay loam			17.2
11.6	52.0	19.8	9.3	Silt loam	1.33	23.7	9.3
8.9	56.3	13.1	19.0	Silt loam	1.42	18.2	8.8
8.7	53.1	17.1	19.0	Silt loam	1.31	18.8	8.8
7.4	44.5	24.2	8.6	Loam	1.61	19.1	10.4
9.7	46.0	25.2	23.8	Loam	1.64	16.9	10.5
9.9	43.0	20.8	29.8	Loam	1.72	15.5	9.9
6.9	51.2	26.6	15.6	Silt loam	1.72	17.0	10.9

TABLE 9.—*Physical*

Soil name, sample number, and location of sample site	Horizon	Depth	Particle-size distribution			
			Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*
Meckesville silt loam; S58-Pa-18-16(1-8); 3 miles N. of intersection of U.S. Route 220 and U.S. Route 120 in Lock Haven.	O2	½-0				
	A1	0-2				
	A2	2-5	0.8	1.7	4.0	9.7
	A3	5-10	1.2	1.7	3.7	8.9
	B1	10-16	1.5	1.5	3.1	8.4
	B21	16-25	.9	1.4	3.3	7.4
	Bx1	25-36	1.9	4.9	12.5	15.0
	Bx2	36-45	1.7	4.0	13.0	16.8
	Bx3	45+	1.0	2.3	11.0	13.8
Murrill gravelly silt loam; S59-Pa-18-19(1-7); 300 feet S. of road intersection at Tylersville in Logan Township.	Ap	0-10	3.8	4.0	4.6	5.0
	B1	10-14	5.5	4.1	6.6	3.5
	B21	14-21	5.9	4.9	6.9	2.9
	B22	21-35	5.1	4.2	5.9	2.8
	B23	35-44	4.4	3.6	6.6	2.8
	B31	44-62	2.5	3.3	12.6	7.2
	B32	62-68	2.1	2.7	12.5	6.5
Murrill gravelly silt loam; S59-Pa-18-20(1-7); 1 mile W. of Mackeyville; on the south side of Fishing Creek.	Ap	0-9	3.2	2.8	9.5	4.3
	A3	9-15	2.0	2.7	9.1	4.6
	B1	15-22	2.5	2.5	8.6	3.9
	B21	22-36	1.9	2.1	6.2	4.0
	B22	36-52	1.6	1.8	5.1	2.6
	B31	52-69	3.2	3.3	6.3	3.7
	B32	69-72+	4.0	4.3	8.6	3.9
Wiltshire silt loam; S58-Pa-18-3(1-10); 2.25 miles SE. of Salona.	Ap	0-7	2.3	2.0	4.2	6.0
	A2	7-11	1.1	.9	2.2	5.0
	B21	11-15	.7	.9	3.3	7.6
	B22	15-23	1.2	1.6	3.7	10.3
	IIBx1	23-34	28.4	20.2	8.4	4.6
	IIBx2	34-39	15.1	10.0	3.3	2.5
	IIIBx1	39-48	1.0	1.1	1.3	1.8
	IIIBx2	48-53	1.0	1.1	1.2	1.5
	IVC	53-61	8.9	6.2	6.2	7.6
	VC	61-68	.7	.8	.5	.6
Wiltshire silt loam; S58-Pa-18-8(1-8); 1.3 miles NW. of Clintondale.	Ap	0-6	2.0	2.3	2.0	2.2
	A2	6-10	2.7	3.2	2.6	3.3
	B21	10-19	2.2	3.1	2.9	3.3
	B22	19-24	2.6	3.5	2.8	3.3
	B23	24-30	4.5	3.9	3.2	3.2
	Bx1	30-36	6.2	6.5	4.8	3.6
	Bx2	36-42	2.3	2.4	1.8	1.6
	Bx3	42+	5.6	5.8	3.8	3.6

properties of selected soils—Continued

Particle-size distribution—Con.			Coarse fragments (greater than 2 mm.)	Textural class	Bulk density	Moisture held at tension of—	
Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)				⅓ atmosphere	15 atmospheres
Percent	*Percent*	*Percent*	*Percentage by weight*		*Gm./cc.*	*Percent*	*Percent*
			14. 2				39. 3
1. 4	69. 4	13. 0	4. 5	Silt loam	1. 21	20. 1	7. 2
. 6	65. 8	18. 1	19. 4	Silt loam	1. 30	19. 9	8. 2
. 7	62. 9	21. 9	28. 2	Silt loam	1. 61	17. 7	10. 2
9. 9	51. 8	25. 3	38. 5	Silt loam	1. 67	18. 0	12. 3
9. 4	34. 6	21. 7	25. 6	Loam	1. 66	16. 3	10. 5
9. 3	28. 3	26. 9	39. 6	Loam	1. 72	15. 1	11. 3
6. 6	36. 9	28. 4	44. 8	Clay loam			11. 0
4. 3	60. 7	17. 6	13. 2	Silt loam	1. 33	24. 6	9. 0
3. 6	48. 3	28. 4	29. 2	Clay loam	1. 48	20. 4	12. 4
3. 9	40. 2	35. 3	43. 2	Clay loam	1. 65	19. 8	16. 0
3. 9	39. 3	38. 8	39. 7	Clay loam	1. 64	20. 4	15. 8
3. 7	37. 7	41. 2	31. 7	Clay loam	1. 64	21. 6	16. 0
5. 8	38. 2	30. 4	34. 8	Clay loam	1. 77	15. 8	12. 3
5. 6	34. 8	35. 8	27. 8	Clay loam			14. 4
5. 2	55. 7	19. 3	17. 6.	Gravelly silt loam	1. 31	23. 1	7. 9
4. 9	53. 5	23. 2	13. 4	Silt loam	1. 38	19. 9	8. 5
4. 8	48. 3	29. 4	21. 8	Clay loam	1. 60	18. 7	11. 7
4. 0	43. 9	37. 9	26. 8	Silty clay loam	1. 53	20. 3	14. 3
3. 5	51. 7	33. 7	27. 8	Silty clay loam	1. 55	19. 2	12. 8
3. 8	49. 5	30. 2	31. 5	Clay loam and silty clay loam	1. 49	19. 5	12. 2
4. 8	43. 8	30. 6	30. 9	Clay loam			12. 1
6. 0	65. 0	14. 5	4. 7	Silt loam	1. 51	24. 1	7. 8
5. 4	59. 4	26. 0	. 3	Silt loam	1. 52	21. 9	10. 8
6. 3	49. 4	31. 8	. 6	Silty clay loam	1. 55	23. 1	14. 3
8. 5	42. 9	31. 8	2. 8	Clay loam	1. 60	22. 8	14. 4
2. 4	18. 5	17. 5	35. 7	Coarse sandy loam	1. 68	17. 7	12. 1
1. 4	38. 3	29. 4	22. 7	Clay loam	1. 66	19. 4	13. 5
3. 0	61. 2	30. 6	2. 3	Silty clay loam	1. 62	20. 6	12. 3
2. 0	56. 8	36. 4	4. 7	Silty clay loam			14. 2
5. 5	43. 7	21. 9	15. 0	Loam			11. 8
6. 1	28. 2	63. 1	. 8	Clay			12. 2
4. 5	69. 8	17. 2	15. 0	Silt loam	1. 24	29. 4	9. 8
5. 9	60. 7	21. 6	16. 2	Silt loam	1. 40	22. 2	8. 9
6. 5	51. 3	30. 7	29. 0	Silty clay loam	1. 47	20. 0	12. 9
6. 6	50. 1	31. 1	24. 6	Silty clay loam	1. 57	20. 9	12. 9
6. 7	47. 8	30. 7	29. 2	Clay loam	1. 56	19. 6	12. 5
6. 8	43. 8	28. 3	45. 6	Clay loam	1. 50	19. 2	11. 6
4. 6	55. 6	31. 7	21. 2	Silty clay loam	1. 55	19. 8	12. 9
7. 3	38. 5	35. 4	26. 6	Clay loam	1. 54	21. 1	12. 5

TABLE 10.—*Chemical and mineralogical*

Soil name, sample number, and location of sampled site	Horizon	Depth	Reaction	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Cation-exchange capacity (NH_4Ac)	Extractable cations (milliequivalents per 100 grams of soil)	
								Calcium	Magnesium
		Inches	*pH*	*Percent*	*Percent*				
Andover very stony loam; S58-Pa-18-12(1-5); 13 miles SW. of Lock Haven.	A1	0-5	6.8	5.84	0.354	16.5	25.7	14.4	2.5
	A2	5-8	6.4	2.17	.100	21.7	13.5	5.0	1.3
	B2	8-14	5.9	.44	.035	12.6	7.5	1.9	.7
	Bx1	14-21	5.7	.22	.026	8.5	9.2	2.0	1.0
	Bx2	21-45	6.5	.12	.018	6.7	7.0	4.5	1.2
Andover very stony loam; S58-Pa-18-13(1-6); 4.5 miles SE. of Lock Haven.	Ap	0-9	6.5	2.72	.224	12.1	20.9	10.0	1.6
	A2	9-14	6.5	.39	.052	7.5	10.0	3.9	1.2
	B21	14-18	6.6	.26	.045	5.8	8.2	4.2	1.5
	B22	18-27	6.3	.20	.053	3.8	12.2	4.3	3.0
	Bx1	27-32	5.9	.13	.051	2.5	14.1	1.3	3.5
	Bx2	32-38	5.7	.10	.040	2.5	8.7	.9	3.9
Ashton silt loam; S58-Pa-18-1(1-8); 1 mile E. of Lock Haven.	Ap	0-14	6.6	1.93	.148	13.0	18.4	8.3	1.0
	B1	14-22	7.0	.49	.066	7.4	11.6	7.5	.4
	B21	22-34	6.9	.24	.049	4.9	14.1	7.2	.7
	B22	34-40	6.6	.18	.042	4.3	13.4	5.3	.8
	B31	40 48	6.4	.20	.034	5.9	12.2	3.2	.9
	B32	48-54	5.5	.17	.027	6.3	10.0	2.9	.7
	C1	54-65	5.4	.30	.032	9.4	7.2	2.7	.6
	C2	65-72	6.0	.20	.034	5.9	7.8	3.3	.5
Ashton silt loam; S58-Pa-18-2(1-8); 3½ miles E. of Lock Haven.	Ap	0-9	5.6	1.30	.110	11.8	8.6	4.9	.7
	B1	9-13	6.0	.44	.060	7.3	8.4	5.6	.7
	B21	13-22	6.3	.26	.052	5.0	9.2	5.7	.5
	B22	22-30	5.0	.22	.047	4.7	14.1	3.8	.5
	B23	30-39	4.8	.17	.044	3.9	10.7	2.5	.6
	B3	39-48	4.6	.21	.037	5.7	8.7	1.8	3.3
	C1	48-60	4.8	.20	.034	5.9	8.2	2.9	3.3
	C2	60-66	4.8	.20	.027	7.4	7.0	2.4	2.8
Buchanan gravelly silt loam; S58-Pa-18-11(1-7); 1.5 miles E. of Carroll on Route 880.	Ap	0-12	6.4	1.97	.145	13.6	13.0	6.2	.3
	B1	12-17	6.4	.57	.057	10.0	10.6	3.2	.3
	B21	17-21	6.5	.26	.047	5.5	11.8	5.2	.1
	B22	21-27	6.0	.13	.034	3.8	11.3	2.4	.2
	Bx1	27-32	5.3	.10	.020	5.0	10.4	.9	.3
	Bx2	32-41	5.3	.13	.041	3.2	12.4	1.1	.3
	Bx3	41-57	5.2	.13	.042	3.1	11.0	.8	.3
Buchanan gravelly silt loam; S58-Pa-18-15(1-8); 4.0 miles SE. of Mill Hall to Rote.	Ap	0-7	7.2	1.94	.172	11.3	14.4	11.9	.7
	A2	7-9	7.1	.44	.080	5.5	11.3	7.6	.4
	B1	9-14	6.8	.30	.079	3.8	10.9	6.7	.8
	B21	14-20	6.2	.28	.076	3.7	12.0	4.9	1.5
	B22	20-26	5.6	.23	.085	2.7	11.7	2.9	2.5
	Bx1	26-31	5.4	.19	.072	2.6	12.0	2.3	2.8
	Bx2	31-38	5.3	.21	.068	3.1	12.8	2.1	2.7
	Bx3	38-47	5.3	.23	.077	3.0	12.2	2.4	2.5
Dekalb very stony sandy loam; S58-Pa-18-4(1-6); 10½ miles S. of Lock Haven on Route 880.	O2	1-0							
	A1	0-2	4.8	17.22	.508	33.9	29.5	3.4	1.6
	A21	2-3	4.8	2.47	.089	27.8	17.1	2.1	.9
	A22	3-10	5.0	1.46	.055	26.5	8.2	.2	.3
	B21	10-21	4.9	.38	.018	21.1	5.5	.1	.3
	B22	21-35	4.8	.17	.015	11.3	4.9	.1	.2
	C	35-52	5.2	.16	.016	10.0	4.4	.1	.3
Dekalb very stony sandy loam; S58-Pa-18-5(1-6); 2 miles E. of McElhattan on Route 880.	O1	2-1							
	O2	1-0	4.3	4.14	.092	45.0	27.6	.3	.3
	A2	0-2	3.9	.85	.034	25.0	14.8	.2	.3
	A3	2-7	4.8	.32	.022	14.5	7.1	.1	.2
	B21	7-16	4.9	.20	.018	11.1	8.1	.4	.4
	B22	16-28	5.0	.24	.014	17.1	8.9	.1	.6
	C1	28-38	5.2	.20	.012	16.7	6.5	.1	.5

See footnotes at end of table.

properties of selected soils

Extractable cations (milliequivalents per 100 grams of soil)—Con.			Base saturation, sum	Calcium-magnesium ratio	Relative composition of the clay fraction [1]						
Sodium	Potassium	Hydrogen			Quartz	Kaolinite	Illite	Vermiculite	Chlorite	Montmorillonite	Interstratified
			Percent								
0.6	0.7	10.6	63	5.8	x	xx	xx	xxx			xx.
.4	.4	7.5	49	3.8							
.2	.2	5.4	36	2.7	x	x	xx	xx	xx		x.
.2	.1	4.2	44	2.0							
.3	.1	2.2	73	3.8	x	x	xxxx		x		x.
.5	.2	9.7	56	6.3	x	x	xx	x	x		xxx.
.3	.2	4.2	57	3.3							
.3	.2	4.4	58	2.8	x	x	xxxx	x	x		x.
.3	.1	6.8	53	1.4							
.2	.2	8.7	37	.4	x	x	xxxx	x	x		x.
.2	.1	7.9	39	.2							
.4	.2	10.1	50	8.3	x	xxx	xxx	x	x		x.
.4	.2	4.1	67	18.8	x	xxx	xxx	x	x		x.
.4	.2	2.8	75	10.3	x	xxx	xxx	x	x		x.
.3	.2	4.9	57	6.6		xxx	xxx	x	x		x.
.2	.1	5.5	44	3.6	x	xxx	xxx	x	x		x.
.2	.1	4.3	48	4.1	x	xxx	xxx	x	x		x.
.2	.1	2.5	59	4.5	x	xxx	xxx	x			x.
.2	.1	2.1	66	6.6	x	xxx	xxx	x	x		x.
.2	.3	7.0	47	7.0	x	xxx	xxx	x	x		x.
.3	.2	3.9	64	8.0	x	xxx	xxx	x			x.
.4	.2	4.0	63	11.4	x	xxx	xxx	x			x.
.3	.2	7.1	40	7.6	x	xxx	xxx	x	x		x.
.3	.2	8.8	29	4.2	x	xxx	xxx	x			x.
.3	.2	9.2	38	.5	x	xxx	xxx	x	x		x.
.2	.2	6.8	49	.9		xxx	xxx	x	x		x.
.1	.2	5.2	51	.9		xxx	xxx	x	x		x.
.2	.2	6.5	51	20.7	x	xx	xx	xxx			x.
.1	.1	3.8	49	10.7							
.3	.1	3.8	60	52.0	xx	xx	xxx	xx			x.
.2	.1	5.7	34	12.0							
.1	.1	6.4	18	3.0	x	xx	xxxx	xx			x.
.1	.1	6.7	19	3.7							
.1	.1	7.2	15	2.7	x	xx	xxxx	xx			x.
.7	.2	4.0	77	17.0	xx	xx	xx	xxx	x		x.
.6	.2	6.0	59	19.0							
.5	.1	4.7	63	8.4	x	xx	xxx	xx			x.
.5	.1	6.7	51	3.3							
.4	.2	10.1	37	1.2	xx	xx	xxx	xx			x.
.3	.2	9.3	38	.8							
.3	.2	9.0	37	.8							
.3	.2	7.1	43	1.0	x	xx	xxxx	xx			x.
.3	.6	29.0	17	2.1	x	xx	xx	xxxx		x	x.
.2	.3	12.3	22	2.3	x	xx	xx	xxx		x	x.
.2	.2	9.8	8	.7	x	xx	xx	xx			xxx.
.2	.1	5.2	12	.3	x	xx	xx	xxx	x	x	x.
.1	.1	4.6	10	.5	x	xx	xx	xxx	x		x.
.2	.1	3.8	16	.3	x	xx	xx	xxx	x	x	x.
.1	.1	17.4	4	1.0	x	x	xx	x	x	xxx	x.
.1	.1	7.2	9	.7	x	x	x	x	x		xxxx.
.1	.1	3.2	13	.5	x	xx	xx	x	xx		xxx.
.2	.1	6.0	15	1.0	x	xx	xx	xxx	xx	x	xx.
.2	.1	6.3	14	.2	x	xx	xx	xx	xx	x	x.
.2	.1	6.1	13	.2							

TABLE 10.—*Chemical and mineralogical*

Soil name, sample number, and location of sampled site	Horizon	Depth	Reaction	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Cation-exchange capacity (NH_4Ac)	Extractable cations (milliequivalents per 100 grams of soil)	
								Calcium	Magnesium
		Inches	*pH*	*Percent*	*Percent*				
Dekalb very stony sandy loam; S58-Pa-18-6(1-6); 6 miles N. of Lock Haven in State Game Lands No. 89.	O1	1-0							
	A1	0-2	4.5	5.75	0.204	28.2	19.4	0.9	0.7
	A22	2-7	5.0	.96	.046	20.9	6.6	.1	.3
	B1	7-11	4.9	.49	.029	16.9	6.9	.1	.3
	B2	11-20	5.0	.30	.029	10.3	7.3	.1	.3
	B3	20-29	5.2	.22	.024	9.2	7.9	.1	.1
	C	29-34	5.3	.26	.032	8.1	6.8	.4	.3
Dekalb very stony sandy loam; S58-Pa-18-7(1-6); 7½ miles N. of Lock Haven.	O2	1-0	4.8	26.68	1.065	25.1	34.5	.1	1.0
	Bir	0-2	4.8	1.70	.060	28.3	9.6	.1	.2
	A'2	2-8	5.0	.43	.028	15.4	5.0	.1	.2
	B'1	8-13	5.3	.34	.027	12.6	7.6	.1	.2
	B'2	13-23	5.1	.22	.027	8.2	8.2	.1	.3
	C1	23-32	5.0	.19	.018	10.6	5.7	.1	.2
Hagerstown silt loam; S58-Pa-18-9(1-7); 7 miles SW. of Mill Hall on Route 64.	Ap	0-7	6.6	1.42	.114	12.5	11.8	6.3	.9
	B21	7-10	6.8	.55	.051	10.8	16.8	10.4	2.3
	B22	10-15	6.6	.49	.054	9.1	21.3	12.8	3.9
	B23	15-21	6.4	.35	.045	7.8	24.4	12.1	4.4
	B24	21-28	6.1	.29	.035	8.3	21.0	10.0	5.4
	B3	28-32	6.4	.26	.038	6.8	21.2	9.7	5.6
	C	32+	7.8	.16	.032	5.0	20.9	9.0	5.9
Hagerstown silt loam; S58-Pa-18-10(1-8); 4.5 miles SW. of Mill Hall on Route 64.	Ap	0-6	6.6	1.57	.103	15.2	10.6	4.8	.8
	A2	6-11	6.6	.33	.033	10.0	10.8	4.7	.8
	B1	11-16	6.6	.20	.028	7.1	14.0	7.2	1.3
	B21	16-21	6.6	.16	.022	7.3	14.5	6.3	1.7
	B22	21-28	6.2	.12	.019	6.3	12.1	4.0	1.9
	B23	28-34	5.9	.10	.018	5.6	12.9	3.4	2.2
	B31	34-44	5.9	.08	.019	4.2	13.8	3.3	2.5
	B32	44-54	5.9	.10	.022	4.5	16.0	3.1	2.2
Laidig very stony loam; S59-Pa-18-17(1-9); on State forest land, 0.6 mile W. of boundary line between Clinton County and Union County at Tea Springs.	O1	(2)							
	O2	2-0							
	A1	0-1	3.7	1.31	.092	14.2	8.6	.3	.5
	A3	1-6	4.3	1.31	.075	17.5	9.5	.1	.5
	B1	6-10	4.7	.70	.066	10.6	7.6	.1	.1
	B21	10-22	4.5	.30	.036	8.3	6.5	.2	.7
	B22	22-31	4.6	.12	.048	2.5	7.5	.2	.5
	B23	31-43	4.7	.08	.035	2.3	4.9	.2	.6
	Bx	43-60	4.6	.08	.040	2.0	4.9	.1	.5
	C	60-72	4.3	.10	.039	2.6	4.7	.1	.8
Laidig very stony loam; S59-Pa-18-18(1-10); 2.6 miles W. of boundary line between Clinton County and Union County.	O1	3-2							
	O2	2-0							
	A1	0-4	4.6	2.04	.090	22.7	12.9	.2	.3
	A3	4-9	4.8	.98	.061	16.1	7.2	.2	.4
	B1	9-15	4.6	.18	.048	3.8	6.4	.2	.3
	B21	15-25	4.8	.10	.039	2.6	6.2	.3	.2
	B22	25-33	5.0	.10	.057	1.8	9.2	.1	.9
	B23	33-46	5.2	.10	.065	1.5	9.1	.1	.9
	B24	46-55	5.2	.08	.071	1.1	11.2	.2	.4
	Bx1	55-63	5.0	.08	.082	1.0	11.8	.1	.6
	Bx2	63-70+	5.0	.08	.084	1.0	10.8	.2	.6
Meckesville silt loam; S58-Pa-18-14(1-7); 1 mile N. of Lock Haven on U.S. Route 120.	Ap	0-8	7.2	1.94	.176	11.0	13.2	12.9	.5
	A3	8-12	7.5	1.36	.123	11.0	11.2	11.6	.3
	B1	12-17	7.3	.78	.086	9.1	9.5	8.8	.1
	B21	17-23	7.2	.23	.052	4.4	8.8	6.9	.2
	B22	23-29	5.6	.17	.048	3.5	8.1	6.2	.4
	B31	29-38	5.3	.11	.046	2.4	8.4	3.2	1.0
	B32	38-47+	5.1	.17	.040	4.2	11.0	1.8	2.9

See footnotes at end of table.

properties of selected soils—Continued

Extractable cations (milliequivalents per 100 grams of soil)—Con.			Base saturation, sum	Calcium-magnesium ratio	Relative composition of the clay fraction [1]						
Sodium	Potassium	Hydrogen			Quartz	Kaolinite	Illite	Vermiculite	Chlorite	Montmorillonite	Interstratified
			Percent								
0.2	0.2	18.6	10	1.3	x	xxx	xx	xxx	x	x	x.
.1	.1	6.3	9	.3		xxx	x	xx	x		xx.
.1	.1	5.9	9	.3	x	xxx	xx	xx	x	x	x.
.1	.1	6.3	9	.3	x	xxx	xx	xxx	x	x	x.
.1	.1	6.2	6	1.0	x	xxx	xxx	xx	x		x.
.1	.1	6.0	13	1.3	x	xxx	xx	xx	x		x.
.4	.8	58.7	4	.1							
.1	.2	10.5	5	.5	xx	xx	xx	xx		x	xx.
.2	.1	4.5	12	.5							
.2	.1	5.5	10	.5	x	xx	xx	xxx			x.
.2	.1	6.8	9	.3							
.2	.1	3.5	15	.5	xx	xx	xxxx	xx			x.
.3	.3	4.4	64	7.0	xx	x	xx	xx	x	x	xx.
.4	.4	4.3	76	4.5							
.5	.4	5.3	77	3.3	x	xx	xx	xx		x	xx.
.5	.5	6.6	73	2.8							
.4	.5	6.9	70	1.9		xx	xxx	xx		x	x.
.4	.5	7.4	69	1.7							
.4	.5	7.0	69	1.5							
.3	.4	4.4	59	6.0	xx	xx	xx	x	x		xx.
.3	.2	3.5	63	5.9							
.3	.2	3.8	70	5.5	x	xxx	xx	xx		x	x.
.3	.2	4.6	65	3.7							
.3	.2	5.0	56	2.1	x	xxx	xx	xx		x	x.
.2	.2	6.4	48	1.5							
.2	.2	5.3	54	1.3	x	xxx	xx	xx		x	x.
.2	.2	7.5	43	1.4							
.4	.2	9.5	13	.6	xxx	xx	xx	xxx			x.
.4	.2	14.4	8	.2	x	xx	x		x		xxxx.
.7	.2	9.2	11	1.0	x	xx	x		x		xxxx.
.6	.2	7.4	19	.3	x	xx	xx	xx	x	x	xx.
.6	.2	8.6	15	.4							
.6	.2	6.1	21	.3	x	xx	xx	xx		x	x.
.6	.2	6.1	19	.2							
.6	.2	4.6	27	.1	x	xxx	xxx	x			x.
.7	.2	13.9	9	.7	x	xx	xx	xxx			x.
.7	.2	9.5	14	.5	x	xx	xx	xx	x		xx.
.6	.2	8.8	13	.7							
.6	.2	8.8	13	1.5	x	xx	xxx	xx			
.6	.2	10.2	15	.1							
.6	.2	9.6	16	.1	x	xx	xxxx	xx			
.6	.3	13.0	10	.5							
.6	.3	10.5	13	.2	x	xx	xxx	xx			x.
.6	.2	9.8	14	.3							
.7	.3	2.2	87	25.8							
.7	.3	2.0	87	38.7							
.6	.2	2.4	80	88.0							
.6	.2	1.5	84	34.5	x	xx	x	xx			x.
.5	.2	4.4	62	15.5	x	xxx	xxxx	x			x.
.4	.1	7.0	40	3.2	x	xxx	xxxx	x			x.
.3	.1	9.2	36	.6	x	xx	xxxx	xx			x.

TABLE 10.—*Chemical and mineralogical*

Soil name, sample number, and location of sampled site	Horizon	Depth	Reaction	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Cation-exchange capacity (NH_4Ac)	Extractable cations (milliequivalents per 100 grams of soil)	
								Calcium	Magnesium
		Inches	*pH*	*Percent*	*Percent*				
Meckesville silt loam; S58-Pa-18-16(1-8); 3 miles N. of intersection of U.S. Route 220 and U.S. Route 120 in Lock Haven.	O2	½-0							
	A1	0-2		16.45	0.584	28.2	35.9	5.1	0.2
	A2	2-5		1.04	.085	12.2	9.3	4.9	.1
	A3	5-10		.70	.068	10.3	8.1	.2	.2
	B1	10-16		.64	.044	14.5	7.9	.1	.2
	B21	16-25		.30	.040	7.5	8.6	.1	.1
	B22	25-36		.15	.031	4.8	7.9	.1	.9
	B31	36-45		.02	.034	.6	8.6	.2	.4
	B32	45+		.02	.035	.6	8.1	.1	.9
Murrill gravelly silt loam; S59-Pa-18-19(1-7); 300 feet S. of road intersection at Tylersville, in Logan Township.	Ap	0-10	6.4	1.22	.135	9.0	11.9	6.9	.7
	B1	10-14	5.0	.30	.095	3.2	9.9	4.2	.8
	B21	14-21	4.7	.18	.104	1.7	14.4	5.2	.8
	B22	21-35	4.6	.10	.105	1.0	16.2	1.5	2.6
	B23	35-44	4.6	.08	.100	.8	17.3	1.1	1.6
	B31	44-62	4.8	.04	.070	.6	10.3	.9	.9
	B32	62-68	4.6	.02	.060	.3	13.9	.6	1.2
Murrill gravelly silt loam; S59-Pa-18-20(1-7); 1 mile W. of Mackeyville, on the south side of Fishing Creek.	Ap	0-9	7.2	1.54	.130	11.8	11.2	9.0	1.0
	A3	9-15	6.2	.35	.057	6.1	8.1	2.8	1.4
	B1	15-22	5.2	.14	.056	2.5	10.0	2.3	.9
	B21	22-36	5.3	.14	.070	2.0	14.5	2.0	1.3
	B22	36-52	5.2	.12	.058	2.1	13.7	4.6	1.3
	B31	52-69	5.4	.14	.058	2.4	12.1	2.4	2.3
	B32	69-72+	5.5	.14	.071	2.0	12.1	2.3	2.1
Wiltshire silt loam; S58-Pa-18-3(1-10); 2.25 miles SE. of Salona.	Ap	0-7	7.2	1.58	.123	12.8	13.4	8.8	.9
	A2	7-11	7.0	.41	.055	7.4	11.8	5.6	.6
	B21	11-15	6.8	.30	.054	5.6	14.8	2.6	1.4
	B22	15-23	4.8	.23	.051	4.5	15.0	2.0	1.0
	IIBx1	23-34	5.0	.17	.051	3.3	16.3	3.1	.8
	IIBx2	34-39	5.1	.17	.068	2.5	18.1	3.2	1.0
	IIIBx1	39-48	4.9	.17	.055	3.1	16.1	2.9	.8
	IIIBx2	48-53	5.4	.20	.077	2.6	16.0	2.2	.7
	IVC	53-61	5.5	.12	.048	2.5	14.7	2.9	2.9
	VC	61-68	5.8	.17	.049	3.5	17.7	6.8	5.4
Wiltshire silt loam; S58-Pa-18-8(1-8); 1.3 miles NW. of Clintondale.	Ap	0-6	7.0	2.29	.169	13.6	14.3	8.5	.9
	A2	6-10	7.1	.51	.049	10.4	10.8	7.9	.6
	B21	10-19	6.6	.35	.042	8.3	13.8	7.4	1.2
	B22	19-24	6.3	.26	.033	7.9	13.0	6.0	1.8
	B23	24-30	5.7	.19	.029	6.6	13.1	5.1	2.1
	Bx1	30-36	5.8	.16	.023	7.0	12.2	3.6	2.2
	Bx2	36-42	5.9	.10	.018	5.6	11.6	3.4	2.4
	Bx3	42+	6.0	.12	.009	13.3	10.2	3.2	2.4

[1] x=low; xx=moderate; xxx=abundant; xxxx=dominant.

Highways and the U.S. Bureau of Public Roads. These additional tests are reported in table 4 in the subsection "Engineering Uses of the Soils."

Methods of Analyses

In all the chemical procedures used, air-dry samples were crushed with a rolling pin so that the material would pass through a round-hole sieve. Care was taken to avoid breaking the nonsoil material into fragments so small that they would pass the 2-millimeter sieve. The percentage by weight of fragments coarser than 2 millimeters was determined. All laboratory determinations, except those for bulk density and moisture retention at tension of ⅓ atmosphere, were made on the part of the sample consisting of soil material less than 2 millimeters in diameter, and results are reported on that basis.

Particle size was determined by the pipette method with dispersion by sodium hexametaphosphate and by mechanical shaking (*5*, *6*).

Bulk density, expressed in grams per cubic centimeter, was determined on 1- by 2-inch cylindrical core samples. The samples were taken with the Salinity Laboratory modified Uhland core sampler (*16*).

In the samples examined moisture retained at a tension of ⅓ atmosphere was determined with a porous plate (*13*) on the core samples. Moisture retained at a tension

properties of selected soils—Continued

Extractable cations (milliequivalents per 100 grams of soil)—Con.			Base saturation, sum	Calcium-magnesium ratio	Relative composition of the clay fraction [1]						
Sodium	Potassium	Hydrogen			Quartz	Kaolinite	Illite	Vermiculite	Chlorite	Montmorillonite	Interstratified
			Percent								
0.4	0.2	45.7	11	25.5							
.4	.1	9.8	36	49.0	x	xxx	xx	x			xxx.
.3	.1	9.2	8	1.0	x	xxx	xx	xx			xx.
.2	.1	9.4	6	.5							
.3	.1	10.4	5	1.0	x	xxx	xxx	xx			x.
.3	.1	10.5	12	.1							
.2	.1	9.4	9	.5		xxx	xxx	xx			x.
.2	.1	9.2	12	.1							
.4	.3	7.7	52	9.9	xx	xx	xx	x			xxx.
.3	.3	7.3	43	5.3							
.3	.3	9.8	40	6.5	x	xx	xxxx	xx		x	x.
.3	.3	14.7	24	.6							
.3	.3	16.0	17	.7	x	xx	xxxx	xx		x	
.2	.3	10.9	17	1.0							
.4	.3	12.5	17	.5	x	xx	xxx	xx		x	
.3	.5	6.1	64	9.0	xx	x	xx		x		xxx
.2	.2	7.1	39	2.0							
.3	.3	11.3	25	2.6	xx	x	xxx	xx			x.
.3	.3	10.4	27	1.5							
.3	.4	10.5	39	3.5	x	xx	xxx	x	x	x	x.
.2	.4	11.0	32	1.0							
.3	.3	12.0	29	1.1	x	xx	xxx	xx			x.
.3	.4	2.9	78	9.8	xx	x	xx	xxx	xx		xx.
.3	.4	2.5	73	9.3	x	xx	xxx	xx	x		x.
.3	.4	4.5	51	1.9	x	xx	xxx	xx			x.
.2	.3	7.1	33	2.0	x	xx	xxxx	xx			x.
.2	.2	7.5	36	3.9	x	xx	xxxx	xx	x		x.
.2	.2	10.4	31	3.2	x	xx	xxxx	xx			x.
.2	.2	8.1	34	3.6	x	xx	xxxx	xx			x.
.3	.2	10.7	24	3.1	x	xx	xxxx	xx			x.
.3	.2	6.9	48	1.0	x	xx	xxxx	xx			
.4	.4	7.3	64	1.3	x	x	xxxx	xx	x		
.4	.6	5.0	68	9.4	x	xxx	xx	xx	x		xx.
.3	.2	2.2	80	13.2							
.3	.4	3.0	76	6.2	x	xxx	xx	xx		x	x.
.3	.4	3.1	73	3.3							
.3	.4	4.5	64	2.4	x	xxx	xx	xx		x	x.
.2	.4	4.6	58	1.6							
.2	.4	3.0	68	1.4	x	xxx	xx	xx	x	x	x.
.2	.3	3.0	67	1.3							

[1] Trace.

of 15 atmospheres was determined by using the pressure membrane apparatus on the fragmented samples (*8*).

The pH was determined by using the Beckman zeromatic pH meter and a 1:1 soil-water ratio. Organic carbon was determined by wet combustion, using a modification of the Walkley-Black method (*7*). The Kjeldahl method (*2*), modified by trapping ammonia in a boric acid solution and titrating with sulfuric acid, was used to determine total nitrogen.

Extractable calcium, magnesium, sodium, and potassium were determined by extraction with neutral normal ammonium acetate (*7*). Extractable hydrogen was determined with a barium chloride solution buffered at pH 8.1 with triethanolamine (*7*). The cation-exchange capacity was determined by distillation of adsorbed ammonia after extraction with sodium chloride (*7*).

Clay minerals were determined by means of a Norelco X-ray spectrometer equipped with a Geiger counter and chart recorder and using a copper target. Flat, oriented clay samples (less than 2 microns), in the form of a thin film on a glass slide, were analyzed as magnesium saturated-water solvated, as magnesium saturated-glycerol solvated, and as potassium saturated-water solvated specimens. Prior to saturation, organic matter was removed from the clay by treatment with 10 percent hydrogen peroxide, and free iron oxides were removed by the method developed by Jeffries (*4*). The clay mineral types designated chlorite refer to 14 angstrom clay material that

does not collapse upon potassium saturation and heat treatment.

Summary of Data

Most of the soils analyzed are medium textured, but the Dekalb soils are moderately coarse textured. In the soils analyzed the texture of the surface soil ranges from silt loam to sandy loam. Most of the soils have a moderately high content of coarse fragments, which range from 0 to 62 percent by weight. Nearly all of the soils show evidence of some downward movement of clay, and most have a clayey B horizon.

Bulk density is medium, and in most of the soils, bulk density in the B horizon ranges from 1.4 to 1.6. The maximum bulk density in the B horizon is 1.77. Bulk density could not be measured for some of the horizons because pebbles and fragments of stone prevented sampling with the equipment used. In cultivated soils the bulk density of the Ap horizon ranges from 1.24 to 1.51, and in half of the cultivated soils sampled it was more than 1.35. The high density indicates considerable compaction because of traffic. Moisture held against 15 atmospheres tension, which is about the wilting point of most plants, ranges from 6.4 to 14.0 percent for the surface layer of the soils, and it is as much as 25 percent for the most clayey subsoil tested.

All of the soils tested are naturally acid, but several have horizons that, as the result of liming or of transportation of bases by percolating ground water, are now neutral or nearly so.

The organic-matter content of the plow layer, as shown by the content of organic carbon, was moderate for all of the cultivated soils. The carbon-nitrogen ratio is low for all of the cultivated soils and high to very high for the woodland soils. One of the soils was sampled in an orchard and showed an intermediate carbon-nitrogen ratio.

The cation-exchange capacity is low for most of the soils, except in the surface layer, which has a high content of organic matter. The maximum cation-exchange capacity in the B horizon is 24.8 milliequivalents per 100 grams of soil. Degree of base saturation in the subsoil ranges from 5 to 100 percent.

The calcium magnesium ratio varies widely within individual profiles and from soil to soil. The variation is the result of liming practices, the wide range of liming materials used, and the differences in composition of bedrock within short distances.

The most common clay minerals are kaolinite, illite, and vermiculite. Clay mineralogy is closely associated with the parent material with some interstratified and some montmorillonite clay in certain profiles as indications of some alteration.

The soils analyzed are in the following great soil groups and intergrades between those groups: Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic); Gray-Brown Podzolic (intergrading to Alluvial); Red-Yellow Podzolic; Sols Bruns Acides; and Low-Humic Gley. They occur on flood plains, rolling uplands, colluvial toe slopes of mountains, steep mountainsides, and highland plateaus.

Some of the results of the analyses of the various soils are discussed in the paragraphs that follow. All of the profiles that were sampled are described in the section "Formation, Morphology, and Classification of Soils" under the heading "Detailed Descriptions of Soil Profiles." The analytical data for each layer of soil in the various profiles sampled are given in tables 9 and 10.

Andover Very Stony Loam

The Andover soils are in the Low-Humic Gley great soil group. Two samples of Andover very stony loam were analyzed. One of the sites from which the samples were taken was in woodland, which had been grazed and trampled by livestock. The other site was in a weedy, bluegrass pasture that had been plowed at least once, even though the area contained many cobblestone, pieces of stones, and small boulders. Clay films in these samples indicate some clay movement, but layering of variable soil materials in sample S58–Pa–18–12 causes decrease of both clay and silt downward in that profile. Bulk density could only be determined for three horizons of S58–Pa–18–13, but it was fairly high, even above the fragipan. Available moisture capacity of these same horizons ranges from 0.16 to 0.26 inch of water per inch of soil.

The profiles of the two Andover soils sampled are much less acid than usual for the Andover series. Also, the degree of base saturation is high. Consequently, they must be considered nontypical of the series, although they are representative of a large proportion of the Andover soils in this county. Both sites from which the samples were taken are on slopes below beds of calcareous shale and thin-bedded limestone. These beds of shale and limestone are covered by colluvium and do not enter directly into soil formation but furnish a source of carbonates for ground water that moves laterally through the Andover soils. In wet weather the ground water comes to the surface in springs and seep spots. The content of organic matter is moderately high in both profiles and is within the range expected in a Low-Humic Gley soil in this area.

Illite is dominant in this colluvial material; however, the upper horizons contain slightly more vermiculite and interstratified vermiculite and chlorite than the lower horizons.

Ashton Silt Loam

The Ashton silt loams are Gray-Brown Podzolic soils that are intergrading toward Alluvial soils. Both of the soils analyzed developed on alluvial plains along the West Branch of the Susquehanna River. The areas are above the usual high water level, but they are subject to occasional flooding by overflow from the river. Both soils formed in relatively uniform material and show a moderate amount of profile development. The plow layer in sample S58–Pa–18–2, however, appears to have been modified by fairly recent deposits of alluvium. The alluvium consists mainly of extra fine and very fine sand but includes small amounts of silt, clay, and organic matter. In both profiles there is some clay movement along the faces of peds and some increase of clay in the subsoil. Both profiles are almost free of gravel. Bulk density is moderate. The available moisture capacity ranges from 0.14 to 0.22 inch of water per inch of soil.

Both profiles are moderately acid, even though the alluvium in which the soils are formed comes from upland soils weathered from material that contained some limestone. Base exchange capacity is moderately low. The degree of base saturation is fairly high in the surface soil and in the deepest horizons sampled, but it decreases to

about 35 percent in the horizon that contains the most clay. Calcium is the dominant exchangeable basic ion, except in the lower horizons of sample S58–Pa–18–2, which contain considerable magnesium.

Kaolinite and illite are the dominant clay minerals and are equally distributed throughout the profile.

Buchanan Gravelly Loam

The Buchanan gravelly loams are moderately well drained to somewhat poorly drained Red-Yellow Podzolic soils that have a fragipan. Of the two samples analyzed, sample S58–Pa–18–15 shows typical increase in clay in the B horizon. Sample S58–Pa–18–11 does not show the clay increase indicated by the field description. It has a decrease in silt and fine sand in the B horizon and an equivalent increase in coarser sand. Bulk density is high, even in the horizons above the fragipan. Coarse fragments are abundant. The available moisture-holding capacity is generally low in both profiles, and erratic data were obtained for some samples because of the content of gravel and the high density.

Both profiles are strongly acid in the lower horizons but show effects of liming. Both profiles have moderately low cation-exchange capacity. The degree of base saturation is high in the upper horizons and decreases downward. Nevertheless, in samples S58–Pa–18–15 base saturation in the lower horizons remains fairly high.

Extractable magnesium is low in all horizons of sample S58–Pa–18–11. It is fairly abundant, however, in the lower horizons of sample S58–Pa–18–15, which suggests that this soil may have formed from parent materials that were higher in bases.

These soils have almost 2 percent of organic carbon in the plow layer, and they have a narrow carbon-nitrogen ratio.

Clay mineralogy shows a relationship between illite and vermiculite in that the abundance of one depresses the abundance of the other. Vermiculite is more abundant in the uppermost horizon of these profiles.

Dekalb Very Stony Sandy Loam

The Dekalb soils are moderately deep, well-drained Sols Bruns Acides that are medium textured to moderately coarse textured. Four samples of Dekalb very stony sandy loam were analyzed. Samples S58–Pa–18–4 and S58–Pa–18–5 were taken near the crests of sandstone ridges in the strongly folded Ridge and Valley province where highly quartzitic Tuscarora sandstone is the principal parent material. Samples S58–Pa–18–6 and S58–Pa–18–7 were taken in the Allegheny Mountain section where the parent materials are nearly level beds of hard, gray sandstone and conglomerate of the Pottsville formation.

Most of the Dekalb soils in the county are very stony and have remained in woodland. All of the sites from which the samples were taken were wooded. Coarse fragments in the soil that were sampled ranged from about 5 to more than 40 percent by weight even after some boulders and stones were excluded in sampling. The texture is mostly fine sandy loam, but it ranges from sandy loam to loam. The content of clay is low in all horizons. Some clay increase occurs in the lower horizons of samples S58–Pa–18–6 and S58–Pa–18–7, but the increase is not enough for a horizon of accumulation. Bulk density was not determined, because of the large amount of hard sandstone fragments.

All of the soils sampled are strongly acid to very strongly acid, and the pH is mostly between 4.8 and 5.2. The cation-exchange capacity is very low, except for the A1 horizon, which has a high content of organic matter. Base saturation is mostly less than 15 percent, and the calcium-magnesium ratio is low. The content of organic matter is high in the thin A1 horizon of sample S58–Pa–6(1–6), and only a thin O horizon is on the surface of sample S58–Pa–6(1–6). The carbon-nitrogen ratio is very wide in the surface horizon of these soils, which indicates slow decomposition of organic material.

Soils developed from the Tuscarora or Pottsville sandstone have essentially the same clay mineral distribution of kaolinite, illite, and vermiculite and they are present in similar amounts.

Hagerstown Silt Loam

The Hagerstown soils are in the Gray-Brown Podzolic great soil group but are intergrading toward Red-Yellow Podzolic soils. These soils are underlain by relatively pure limestone or dolomite, which leaves little silty or sandy residue. In both profiles sampled, the texture of the surface soil is silt loam. In places fragments of coarse chert and crystalline quartz have accumulated in the soil.

The B horizon of sample S58–Pa–18–9 has a very high content of clay and shows the greatest amount of clay at a depth between 10 and 21 inches. In sample S58–Pa–18–10, the A2 horizon and the upper part of the B horizon, as identified by color and structure, have a texture of silty clay loam. In the same sample the lower part of the B horizon is silty clay. The greatest amount of clay is at a depth below 34 inches, but there is a secondary increase in clay at a depth between 11 and 21 inches. Differences in the amount of silt and clay in the two profiles are apparently because of minor differences in the parent rock.

The C horizon of sample S58–Pa–18–9 was described in the section "Detailed Descriptions of Soil Profiles" as black fine sandy loam that formed a rind about 1 inch thick over hard, gray limestone. The corresponding horizon for sample S58–Pa–18–10 was for material taken from cracks between limestone rocks and was similar to the B3 horizon in sample S58–Pa–18–9. At a third site the sandy material was identified as magnesium carbonate crystals left from partial weathering of dolomitic limestone. Any of this included in the sample was dissolved in pretreatment, and the texture is the same as for the B3 horizon described. The principal difference between the samples analyzed is that the C horizon, which was in contact with limestone, has a higher pH.

Bulk density is relatively low in the subsoil of sample S58–Pa–18–9 because of its high content of clay. Also, the subsoil has strong structure. Total moisture retention at field capacity is high, but the retention at the wilting point is also high. Consequently, the available moisture range in the subsoil is mostly between 0.09 and 0.16 inch of water per inch of soil.

Both profiles are slightly acid to moderately acid, and the lowest pH is at a depth of about 30 inches. In sample S58–Pa–18–9 the deepest horizon was in contact with limestone and was alkaline.

These soils have a moderate content of organic carbon in the plow layer. The carbon-nitrogen ratio is about average for the county. The cation-exchange capacity is higher than for most soils of the county, but it is not high when recalculated to the clay content. The degree of base saturation is moderately high for sample S58–Pa–18–9 and medium for S58–Pa–18–10. Even in the deepest horizon of S58–Pa–18–9 where the soil is in contact with limestone and the pH is high, extractable cations do not equal the exchange capacity. The calcium-magnesium ratio is similar for both soils and becomes progressively narrow with increasing depth. It is based on the somewhat higher content of both cations in sample S58–Pa–18–9.

Sample S58–Pa–18–10 contains more kaolinite than sample S58–Pa–18–9, in which there is a slight increase of illite in the C horizon.

Laidig Very Stony Loam

The Laidig soils are in the Red-Yellow Podzolic great soil group. Both samples analyzed were taken in woodland in moderately sloping areas on mountains. Both profiles had organic surface horizons, but these were not analyzed. The soils are loamy and contain a large amount of sandstone fragments that range from 2 millimeters to about 10 inches in diameter. They have many boulders on the surface. Sample S59–Pa–18–17 has an eluviated surface layer, which is 1 inch thick and is much more sandy than the rest of the profile. The increase in clay below the A2 horizon and down to the A3 horizon and the upper part of the B horizon is sufficient for a Red-Yellow Podzolic soil. Sample S59–Pa–18–18 has a more pronounced change at greater depth and a stronger color contrast between the A and B horizons than the other profile. Bulk density was not determined for these profiles because of the large amount of hard sandstone fragments. Both profiles are strongly acid to very strongly acid. The degree of base saturation and the cation-exchange capacity are low. These soils are very low in extractable calcium.

Clay mineralogy shows more vermiculite in the upper horizons of the soils than in the lower horizons, where illite and kaolinite are abundant.

Meckesville Silt Loam

The Meckesville silt loams are Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. Two samples of Meckesville silt loam were analyzed. One was taken in a cultivated field and the other in woodland. Both profiles are silt loam, but the one taken in the wooded site contains more silt particles. Both profiles show a decrease in silt and an increase in clay in the lower horizons. A few sandstone fragments occur throughout sample S58–Pa–18–14, but more are in sample S58–Pa–18–16. Clay films indicate movement of clay, which is confirmed by the laboratory data. Bulk density is high in both profiles. Available moisture holding capacity is moderate and ranges from about 0.07 to 0.20 inch of water per inch of soil for the various horizons.

The site sampled in a cultivated field had been heavily limed. As a result, the profile is neutral to a depth of 14 inches, but below that depth it is strongly acid. The profile sampled in woodland is strongly acid throughout. The content of organic matter in the Ap horizon of sample S58–Pa–18–14 is medium and the carbon-nitrogen ratio is narrow. In sample S58–Pa–18–14, the wooded site, the content of organic matter is very high in the upper 2 inches, and the carbon-nitrogen ratio is wide. The cation-exchange capacity is low in relation to the clay content and the degree of base saturation is very low in the woodland soil. The other soil has been limed and fertilized and has extractable cations in excess of the exchange capacity in the upper horizons. Furthermore, the cation content is high in the upper horizons but decreases to a depth of 47 inches. Because of additions of lime and fertilizer, calcium is particularly abundant in the cultivated soil and sodium and potassium have also increased.

Illite is dominant in the lower horizons of S58–Pa–18–14, but it and kaolinite are abundant in the lower horizons of sample S58–Pa–18–16.

Murrill Gravelly Silt Loam

The Murrill gravelly silt loams are Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. Both profiles sampled have a silt loam A horizon and a gravelly clay loam subsoil. A mixture of these horizons in eroded areas would produce the gravelly loam characteristic of the series. There is a strong increase in clay in the B horizon of both profiles. Bulk density is moderately high in the B horizons. The available moisture capacity varies within the profile; it ranges from 0.06 to 0.20 inch of water per inch of soil.

Both profiles are strongly acid, except for the A horizon, which has been limed. Organic carbon is low, and the carbon-nitrogen ratio is narrow. The cation-exchange capacity is medium. Degree of base saturation is high for the surface soil. It is moderately high for the subsoil of sample S59–Pa–18–20 but low for sample S59–Pa–18–19.

Illite is the most abundant clay mineral in the Murrill soils that were sampled. Interstratified vermiculite and chlorite clay minerals are more abundant in the surface horizon than in the deeper horizons.

Wiltshire Silt Loam

The Wiltshire silt loams are moderately well drained. They are Gray-Brown Podzolic soils that are intergrading toward Red-Yellow Podzolic soils. Both profiles sampled developed in a mixture of alluvium and colluvium in low areas in limestone valleys, which is the characteristic site in this county. Both profiles show some stratification of material, but stratification is most prominent in sample S58–Pa–18–3. In places this profile also contains a mixture of sandstone pebbles washed from the mountains. The coarse fragments in sample S58–Pa–18–8 are mostly chert weathered from cherty limestone materials nearby. Both profiles have clay films and clayey B horizons. Bulk density is moderate in the upper part of the profile. In sample S58–Pa–18–3 the density is moderately high in the fragipan, but in sample S58–Pa–18–8 the fragipan is less dense and not so well defined. The available moisture capacity ranges from 0.09 to 0.25 inch of water per inch of soil.

Both soils have been limed and are therefore neutral in the upper part of the profile. They are strongly acid in the middle part of the B horizon and less acid in the lower part of the fragipan. The cation-exchange capacity is moderate in the B horizon of both soils. Degree of base saturation is high in the upper part of the profile. It increases in the lower horizon sampled but is moderately low in the upper and middle parts of the B horizon, partic-

ularly in sample S58–Pa–18–3. Calcium is dominant in the upper part of the profile, but the calcium-magnesium ratio narrows in the lower part.

Additional Facts About the County

This section provides general information about the physiography and geology, climate, water supply, native vegetation, and agriculture of Clinton County.

Physiography and Geology

Clinton County lies partly in the Allegheny High Plateau section of the Appalachian Plateaus province and partly in the Appalachian Mountain section of the Ridge and Valley province.[7] Each of these has a characteristic topography, and the geologic formations of each are of different ages.

The Allegheny Plateau makes up almost two-thirds of the county. The Allegheny Front, an escarpment that faces southeast, marks the beginning of the Allegheny Plateau. It extends diagonally across the county from the northeast to the southwest about 3 miles north of Lock Haven, near Swissdale. The Allegheny Plateau section is deeply dissected. It ranges in elevation from 554 feet in the valley at the airport in Lock Haven to 2,250 feet at the Tamarack Fire Tower, north of Renovo. On the plateau proper, elevations range from 1,400 to 2,000 feet. Throughout the Allegheny Plateau section, the rocks are mildly folded. The area between the deep valleys is broad, fairly level or undulating, and in places higher masses rise above it. From a distance the horizon suggests a peneplain, and Hyner View Lookout, 20 miles north of Lock Haven, provides a good view of the physiography of the Allegheny Plateau.

The rocks underlying the Allegheny Plateau in Clinton County are of Mississippian and Pennsylvanian age, except at the base of the escarpment, where the rocks are of Devonian age. The major rocks in the Allegheny Front consist of thick beds of Pocono sandstone, topped with a thin layer of Mauch Chunk red shale. Pocono sandstone is a hard, gray, fine-grained sandstone that weathers slowly. At the base of the escarpment, the rocks are of the Catskill formation. Coarse-grained sandstone and conglomerate of the Pottsville formation, which weathers readily, and hard sandstone and soft shale and coal of the Allegheny formation are the rocks that underlie the Plateau proper. In the northern part of Clinton County is a broad anticline in which shale and sandstone of the Catskill formation are exposed in red beds, near Tamarack.

The Ridge and Valley province area in the county extends from Bald Eagle Mountain southward. The area between Bald Eagle Mountain and the Allegheny Front is transitional between the strongly folded area of the Ridge and Valley province to the deeply dissected Allegheny Plateau.

In the Ridge and Valley province are steep sandstone ridges that have narrow tops and are between broad limestone valleys. Where two or more ridges join, a broad plateau is formed. Underlying the ridge is hard, fine-grained sandstone of the Tuscarora and Juniata formations. The rocks of the Tuscarora formation are of quartzite in many places, and a bare rocky area of this material is exposed on Bald Eagle Mountain, 2 miles east of Lock Haven. The valley floors are underlain by Ordovician limestone from several formations and of varying purity. Shale of the Reedsville formation outcrops in areas that circle the limestone valleys. Elevations in the Ridge and Valley area range from 2,290 feet at Mt. Riansares to about 700 feet in the Nittany Valley.

An area in the Ridge and Valley province, 3 or 4 miles wide and that extends from the base of Bald Eagle Mountain to the Allegheny escarpment near Swissdale, was glaciated. It is along the West Branch of the Susquehanna River and along Bald Eagle Creek from Pine Creek to Beech Creek. The area is steeply rolling and very dissected. Slopes are short and steep.

Throughout the glaciated area, and at all elevations, are small pockets of soil that contain gravel and stones, mainly shale and sandstone but also rounded quartzite. All of these are foreign to the immediate area. The material in the pockets has many characteristics of glacial till. In many places between these pockets of soil, evidence of glaciation is lacking. Along the Susquehanna River near Avis, Lockport, and other places are high terraces, probably formed by glacial melt water. There is no evidence that the glacier crossed Bald Eagle Mountain, although in places in Sugar Valley mud flows indicate that a periglacial climate had some influence there. Also, the gravelly and cobbly fans at McElhattan, Rauchtown, and Woolrich were probably deposited during glacial time by large volumes of water that gushed from mountain streams.

In the glaciated area at the base of the Allegheny Front, the underlying rocks are red shale and sandstone of the Catskill formation and shale of the Chemung and Portage formations. Limestone of the Helderberg formation outcrops in small areas in various places from Lock Haven westward to Beech Creek.

Climate[8]

Clinton County has a humid continental climate. Summers are warm; winters are long and cold; and the temperature changes frequently and sometimes rapidly. Precipitation is normally well distributed throughout the year, though precipitation in summer is generally greater than that received in the cold months.

The county is in the heart of the mountain system in central Pennsylvania where the prevailing winds are from the west. The climate is therefore influenced much more by winds blowing over the continent than by winds coming from the Atlantic Ocean. Consequently, variations in the weather are common. In winter and spring changes in weather occur almost daily. In summer and fall, however, changes in weather are less frequent because of slower movement of the high and low pressure systems.

From June through October weather systems occasionally stagnate, and then the same weather persists for a week or 10 days. Generally during such periods in summer, the days are humid and hot, and the nights are mild. If such conditions develop in fall, the days are dry and

[7] Physiographic provinces according to Topographic and Geologic Survey, Commonwealth of Pennsylvania.

[8] By Nelson M. Kauffman, U.S. Weather Bureau, State climatologist, Harrisburg, Pa.

balmy and the nights are cool. One or more of such periods can be expected each year, but in some summers these heat waves are absent. On the other hand, cold snaps of as much as 5 days are fairly frequent from December through February. Then brisk northwesterly winds prevail, and temperatures are likely to be well below freezing.

The weather is also affected by local topography and by the elevation. In the valleys the average temperature is slightly higher and rainfall is slightly lower than at higher elevations. The minimum temperature in the valleys is lower, however, than on the surrounding higher areas, because cold air is heavier and drains into the valleys and lowers the temperature. Freezing temperature in the valleys therefore occurs later in spring and earlier in fall than on the surrounding higher elevations, and the growing season is somewhat shorter. Windspeed and direction are also affected by local relief. The direction of the wind is controlled primarily by movement of atmospheric pressure systems, but at lower elevations the prevailing winds generally blow parallel to the valleys.

Table 11, compiled from records kept at Lock Haven since 1888, gives temperature and precipitation data that are typical for the county. The station has been moved several times, but it has always remained within the town and in the valley of the West Branch of the Susquehanna River at elevations of 560 to 680 feet. The data given are more representative of the climate in the valleys of Clinton County than of the climate on the mountains, but they are nevertheless useful for planning purposes.

Temperature.—Clinton County is in one of the coldest parts of Pennsylvania. The average annual temperature is 51.3° F., which is several degrees lower than in the southeastern part of the State. The average monthly temperature in January is 29.4°, and in July is 73.5°. In the mountains the average temperature is several degrees lower, but the daily extremes are somewhat less than those in the valleys. In most years the daily temperature does not drop below zero nor rise above 100°, but occasionally more extreme temperature occurs. The lowest temperature reported at Lock Haven was −22°, and the highest was 106°.

From May through September, temperatures of 90° and more can be expected on an average of 23 days. As many as 9 days of such temperature can be expected in July, and in June and August 5 days each of such temperature can be expected. In some years the temperature has been in the 90's as early as April and as late as October, but these are rare. Daily temperatures of 100° or more occur on an average of only once every other year, but such temperatures have been recorded on as many as 5 days in 1 year. On the other hand, temperatures of zero or below can be expected on an average of 3 times each winter, and they occur on an average of once a month from December through February. During very cold winters, below zero temperatures have been recorded on as many as 21 days, but in some winters the lowest daily temperatures have remained above zero.

Variations in daily temperatures, both in extremes and averages, are quite noticeable. It is more likely that the temperature will vary from one day to the next than that several consecutive days will have little change in temperature. Generally differences in daily temperature are as much as 15° to 20° in winter, and 25° to 30° in summer, which are not quite so great as in the central part of the United States nor so small as in areas near the ocean. Pronounced changes in temperature within fairly short periods are rare. Occasionally, however, during winter and early in spring, rapidly moving masses of cold air cause temperatures to drop 30° or 40° in 12 to 24 hours. Warming trends are generally not so abrupt.

The probability of freezing temperatures after specified dates in spring and before specified dates in fall are given in table 12. The data in table 12 are from records kept at Lock Haven, but they apply to other areas in the county where the elevation and the air drainage are similar. Where air drainage is poor, such as in bowl-shaped valleys, and regardless of elevation, freezing temperatures are likely to come earlier in fall and later in spring. At higher elevations the altitude tends to counteract the effect of good air drainage, and freezing temperatures occur somewhat earlier in fall and later in spring.

The interval between the last 32° temperature in spring and the first in fall is generally known as the growing season. It extends normally from May 4 to October 10 at Lock Haven, which is 159 days. Nevertheless the last freeze in spring has occurred as early as April 15 and the first freeze in fall has occurred as late as November 14. At Lock Haven the growing season has never been longer than 200 days, but in some seasons it has been as short as 119 days. The data in table 12 indicate, for example, that there is 1 chance in 10 that the temperature will be 32° or lower after May 16, and that there are 2 chances in 10 that it will be 32° or lower after May 12. The probabilities listed for 5 years in 10, or 50 percent probability, correspond with the average, or normal, date of occurrence for the specified temperatures. The date for the 32° temperature, May 4, is approximately the beginning of the average frost-free period, and October 10, the end.

Precipitation.—The average annual precipitation is 40 inches at Lock Haven (see table 11), but it ranges from as much as 49.5 inches to as little as 27.8 inches. In the rest of the county, the average annual precipitation ranges from 38 inches in the Renovo area to 44 inches at Tamarack. These figures include the water equivalent of the snowfall.

The amount of precipitation that normally falls each month ranges from 2 to 4 inches, and the largest amount falls late in spring and summer. Precipitation varies considerably from one month to another, as well as for a particular month. It ranges from as little as 0.3 inch in September and October to as much as 10.5 inches in July. The range in individual months, especially in summer, is about the same.

About 56 percent of the annual precipitation falls from April through September. Some of the rain comes in a steady, day-long fall. Most of the rain, however, comes in showers and in thunderstorms that last only a short time and affect only part of the county at any one time. The heaviest rainfall recorded in a short period at Lock Haven came from showers and thunderstorms that produced rainfall in amounts of 2.50 inches in 1 hour, 3.20 inches in 2 hours, 3.46 inches in 3 hours, 3.90 inches in 6 hours, 4.81 inches in 12 hours, and 4.87 inches in 24 hours.

In Clinton County rainfall amounting to 1 inch in 1 hour occurs about once a year and 2 inches in 1 hour occurs once in 25 years. For a period of 24 hours, 2.3 inches of rain

TABLE 11.—*Temperature and precipitation at Lock Haven, Clinton County, Pa.*

Month	Temperature				Precipitation					
	Average daily maximum	Average daily minimum	Average extreme maximum	Average extreme minimum	Average total	One year in 10 will have—		Average snowfall	Average number days with—	
						Less than—	More than—		Snow cover of 1 inch or more	Snow cover of 6 inches or more
	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*		
January	38	22	53	3	2.6	1.1	4.1	8.0	12	3
February	39	21	56	1	2.2	1.0	3.7	8.2	12	3
March	47	27	69	10	3.7	1.9	5.3	8.6	6	1
April	63	38	84	24	3.4	1.7	5.4	1.5	1	0
May	75	47	91	32	4.3	1.2	8.1	0	0	0
June	83	56	95	42	3.5	1.7	5.0	0	0	0
July	87	60	96	48	4.3	2.3	7.4	0	0	0
August	84	59	95	45	3.9	1.2	7.7	0	0	0
September	77	52	91	34	3.1	.8	6.1	0	0	0
October	66	41	82	26	3.1	1.2	6.8	0	0	0
November	49	32	70	16	3.1	1.1	4.8	3.2	1	(1)
December	39	23	60	3	2.8	1.1	4.5	7.3	10	3
Year	63	40	[2] 105	[3] −16	40.0	34.8	45.2	36.8	42	10

[1] Less than 0.5 day.
[2] Average annual highest temperature in period from 1931–1960.
[3] Average annual lowest temperature in period from 1931–1960.

TABLE 12.—*Probabilities of freezing temperature after specified dates in spring and before specified dates in fall*

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 26	April 10	April 17	May 3	May 16.
2 years in 10 later than	March 21	April 4	April 12	April 28	May 12.
5 years in 10 later than	March 12	March 23	April 2	April 19	May 4.
Fall:					
1 year in 10 earlier than	November 20	November 4	October 20	October 2	September 25.
2 years in 10 earlier than	November 25	November 9	October 26	October 9	September 30.
5 years in 10 earlier than	December 2	November 19	November 7	October 22	October 10.

can be expected once a year and 4 inches can be expected once in every 10 years. Heavy rainfall is, of course, not necessarily desirable, even during dry periods. Generally considerable erosion occurs during heavy rains, since the soils cannot readily absorb large amounts of water and much of it runs off.

Precipitation in Clinton County generally provides sufficient water for domestic, industrial, and agricultural needs, except for occasional short, dry periods in summer. In most summers rainfall exceeds 75 percent of the normal fall, but the amount of rainfall in some months may be considerably less than normal. As a result, in some summers crops are damaged by lack of moisture.

Snowfall varies according to the frequency with which storms move through or near Clinton County during the cold season. From about the middle of November through the middle of March, much of the precipitation falls as snow. During March and sometimes in November, snowfall is somewhat greater than in other cold months. Also, the snow sometimes is heavy, because of its high water content, and is likely to damage trees, utility lines, and other exposed objects. Similar heavy snowfall also occurs in April, but the chance of heavy snow in April is somewhat less because temperatures are milder and the precipitation falls as rain instead of snow.

At Lock Haven snowfall of as much as 28 inches has occurred in March, 25 inches in February, 26 inches in January, 24 inches in December, and 30 inches in November. Measurable snow in April occurs on an average of once every other year, and as much as 11 inches of snow has fallen in April. In a few years traces of snow have been observed as late as May 6 and as early as October 20. Snowfall averages about 37 inches a season but ranges 13 to 65 inches. For additional snowfall data see table 11.

Normally the northern parts of the county and the mountains in other parts of the county receive larger amounts of snow than that recorded at Lock Haven.

Tamarack, in the northern part of the county, generally receives 64 inches of snow annually, but Renovo normally receives only 27 inches. At the higher elevations snow cover generally forms in December and remains through March when temperatures moderate and rains melt the snow. Snow cover ranges from 10 to 12 inches, normally, but where drifting occurs, depth of the snow is likely to be much greater. The water content of the snow cover normally ranges from 2 to 3 inches. In some years, however, the water content ranges from 4 to 6 inches, which increases the chance of flooding when the snow melts.

Storms.—Of the severe storms, thunderstorms cause the most damage to crops. They occur on an average of 25 to 30 days each year, generally from May through September, though they occur in any month. The heavy rains that accompany the more severe thunderstorms cause soil erosion and injury to plants and probably do more damage than the lightning that accompanies them.

Spring and summer thunderstorms are sometimes accompanied by hail and high wind. The hailstones are seldom large enough or numerous enough to cause extensive damage. The strong winds, however, are more frequent, and gusts of 50 to 60 miles per hour are common. Tornadoes have occurred in the county, but they are not common and the probability of one occurring is small. Damaging wind or heavy rain caused by remnants of hurricanes affect Clinton County occasionally. Generally the rain from such storms is beneficial, and damage is small.

Water Supply

Clinton County has an abundant supply of water for home, industrial, and public use. The sandstone formations in the Allegheny Mountain section and in the Ridge and Valley province store large quantities of water. Springs are common at the base of the mountains in the limestone valleys, and the city of Lock Haven and other communities use mountain springs and streams to provide the water they need. Ground water is abundant and of good quality in the mountains. Water is also abundant in the limestone valleys, but it is of doubtful quality and should be carefully tested for contamination before being used as drinking water.

In the larger streams, such as the Susquehanna River, Bald Eagle Creek, and Kettle Creek, water reaches the top of the bank once or twice each year and overflows occasionally. Major floods occurred in 1888, 1918, 1936, and 1950. Flood-control dams have been built on some of the major tributaries of the Susquehanna River, and such dams are planned for other rivers.

Water from deep mines and strip mines have contaminated the West Branch of Tangascootack Creek, Cooks Run, and the lower reaches of Kettle Creek. The Susquehanna River is also contaminated from Clearfield County to the northwest. Communities along the Susquehanna River have built or are planning to build sewage disposal plants to help reduce contamination.

Native Vegetation

Originally, Clinton County had a cover of forest. On the mountains a mixture of pines and hardwoods grew, but in the limestone valleys and along the streams the cover was hardwoods. In Tamarack swamp and in other swampy areas were black spruce, which is indigenous to northern swamps.

Lumbering was a major business as long as the timber lasted, and the pool in the river at Lock Haven where logs were stored was the scene of intense activity. The trees were cut heedlessly. Little thought was given to good forestry practice that would assure future trees for harvesting. Repeated fires in the logged areas ruined the timber left standing and destroyed seedlings. Consequently, after the flood of 1888, which scattered logs from Clinton County to the Chesapeake, lumbering declined. Today, the forests consist mainly of various kinds of oak, maple, and other hardwoods, but they include small amounts of pitch pine, white pine, and hemlock.

Agriculture

Most farming in Clinton County is in the limestone valleys and in the valley along the West Branch of the Susquehanna River. Farming is also done in the shale hill area and in the Allegheny Mountain section, but the acreage in farms in these areas is small.

In the limestone valleys the soils are fine textured and are highly productive. Here the soils are used principally for dairy farming, since they can provide the forage needed for the animals. Also, the rolling floors of the limestone valleys offer few problems to efficient use of farm machinery. The neat, well-kept farmsteads in the limestone valleys reflect the productivity of the soils.

The farms in the valley of the West Branch of the Susquehanna River produce such special crops as potatoes, tobacco, sweet corn, and peas, as well as general farm crops. Yields are high, and the risk of loss by floods or frost is slight.

The shale hill area, once cultivated fairly intensively, is no longer important agriculturally. Many farms have been abandoned or are now in urban areas. Of the shale hills, the red shale area is farmed the most intensively.

Most farming in the Allegheny Mountain section is done in a small area near Tamarack. The farmers there are engaged mainly in general farming or in dairy farming.

In the following paragraphs agricultural statistics of the county are discussed. The statistics are from reports published by the U.S. Census Bureau.

About 11.6 percent of the county, or 67,013 acres, was in farms in 1959, and the average size of the farms was 136.8 acres. About 93 percent of the farmers owned or partly owned their farms. Of the 490 farms in Clinton County, 190 were used for special crops or were miscellaneous or unclassified. The rest were classified according to the main source of income as follows:

Type of farm:	*Number*
Dairy	230
Poultry	20
Livestock, other than dairy or poultry	15
Field crop	20
General	5

The principal field crops are corn, wheat, oats, barley, alfalfa, and mixtures of grasses grown for hay. Considerable acreages of tobacco and Irish potatoes are also grown. The acreage in alfalfa has increased because of

the need for more feed for the larger numbers of livestock, but that in corn, barley, and soybeans has decreased somewhat. The acreage in potatoes has decreased, but the acreage in tobacco has remained the same. Table 13 gives the acreage of the principal crops in Clinton County in stated years.

TABLE 13.—*Acreage of principal crops in stated years*

Crops	1954	1959
	Acres	*Acres*
Corn for all purposes	6, 830	6, 732
Harvested for grain	5, 805	5, 635
Cut for silage	924	1, 081
Hogged, grazed, or cut for fodder	101	16
Wheat harvested	4, 109	3, 897
Oats harvested	5, 015	4, 610
Barley harvested	749	278
Rye harvested	28	41
Buckwheat harvested	117	24
Soybeans grown for all purposes	197	53
Alfalfa and alfalfa mixtures cut for hay	2, 435	4, 370
Clover, timothy, and mixtures of clover and grasses cut for hay	5, 612	4, 615
Grass silage made from grasses, alfalfa, clover, or small grains	417	787
Irish potatoes[1]	302	203
Tobacco	67	67

[1] Does not include acreage for farms with less than 20 bushels harvested.

Livestock is the chief source of income in Clinton County. In 1959, the number of cattle, including milk cows and steers, increased as compared to 1954, but the number of poultry decreased. Table 14 gives the kinds and numbers of livestock in the county in 1954 and 1959.

TABLE 14.—*Number of livestock in the county*

Livestock	1954	1959
Cattle and calves	7, 006	8, 190
Milk cows	3, 460	3, 838
Steers	886	1, 404
Hogs and pigs	2, 634	2, 838
Sheep and lambs	334	365
Chickens, 4 months old and over	59, 251	39, 666

Agricultural improvement programs.—The farmers in Clinton County are served by several local, State, and Federal agencies. These agencies offer technical assistance and information and provide demonstrations of farming practices that improve soils and soil management. Among these agencies are the following: Clinton County Soil Conservation District, Soil Conservation Service of the U.S. Department of Agriculture, the Pennsylvania State College of Agriculture of the Pennsylvania State University, Clinton County Agricultural Extension Association, Agricultural Stabilization and Conservation Committee, Pennsylvania Department of Forests and Waters, and Pennsylvania Game Commission.

Glossary

[The definitions are based mainly on "The Report of Definitions Approved by the Committee on Terminology" of the Soil Science Society of America (*11*) and from the Soil Survey Manual, U.S. Dept. of Agr. Handb. No. 18 (*15*)].

Aeration, soil. The process by which air and other gases in the soil are renewed. The rate of soil aeration depends largely on the size and number of pores in the soil and on the amount of water clogging the pores.

Alluvial soil. Soil formed from material, such as gravel, sand, silt, or clay, deposited by a stream of water and showing little or no modification of the original materials by soil-forming processes.

Bedding, land. Plowing, grading, or otherwise elevating the surface of fields into a series of parallel beds, or lands, that have shallow surface drains separating them.

Calcareous. Containing calcium carbonate or lime.

Catena, soil. A sequence of soils developed from one kind of parent material but differing in characteristics because of differences in drainage or depth.

Channery soil. A soil that contains thin, flat pieces of sandstone, limestone, schist, or shale as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. See Texture, soil.

Claypan. A compact horizon or layer rich in clay and separated more or less abruptly from the overlying horizon.

Coarse-textured soil. Sand, loamy sand, sandy loam, and fine sandy loam.

Colluvium. Soil formed from material that has been moved downhill by gravity, soil creep, frost action, or local erosion. It accumulates on the lower parts of slopes and at the bases of slopes.

Conglomerate. Rock composed of gravel and rounded stones cemented together by hardened clay, lime, iron oxide, or silica.

Consistence. The feel of the soil and the ease with which a lump can be crushed between the fingers. Terms commonly used to describe consistence follow:

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material.

Hard.—When dry, moderately resistant to pressure; can barely be broken between thumb and forefinger.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Conducting field operations, such as plowing, planting, cultivating, and harvesting, in rows that are at right angles to the natural direction of the slope and as nearly level as practical.

Cover crop. A close-growing crop grown primarily to improve the soil and protect it between periods of regular crop production.

Diversion terrace. A channel that has a supporting ridge on the lower side. It is constructed across the slope to intercept runoff and to carry runoff to a planned outlet. These terraces are maintained in permanent sod.

Drainage soil. (1) The removal of excess surface or ground water from land by means of surface or subsurface drains. (2) The effect of soil characteristics that regulate the ease or rate of natural drainage. See Natural drainage.

Erosion. The wearing away of the solid material of the land surface by wind, running water, or ice, and by such processes as landslides and creep.

Normal (geologic).—The erosion that takes place on a land surface that has not been disturbed by human activity. It includes (1) the erosion of rocks on which there is little or no developed soil, as in stream channels and on rocky mountains, and (2) normal soil erosion, or the erosion of the soil under its natural condition or under a cover of native plants undisturbed by human activity.

Accelerated.—Erosion of the soil or rock over and above normal erosion brought about by changes in the natural cover or ground conditions, including changes caused by human ac-

tivity and those caused by lightning or rodents. There are several kinds of accelerated erosion. They are: (1) *Sheet erosion*, or removal of a more or less uniform layer of material from the land surface. The effects are less conspicuous than those of other types of erosion that produce large channels. Frequently, in sheet erosion the eroding surface consists of numerous very small rills. (2) *Rill erosion*, or erosion by water, which produces small channels that can be obliterated by tillage. (3) *Gully erosion*, or erosion by water that produces channels larger than rills. Normally, gullies carry water only during and immediately after rains or following the melting of snow. Gullies are deeper than rills and are not obliterated by normal tillage.

Fine-textured soil. Sandy clay, silty clay, and clay; also may be used generally in referring to moderately fine textured soils—clay loam, sandy clay loam, and silty clay loam.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick.

Glacial soil material. Material that is transported and deposited by glaciers, from which soil may develop.

Graded stripcropping. Growing crops in strips that are graded toward a protected waterway.

Hardpan. A horizon, or soil layer, that is compact, dense, or brittle and that is generally only slowly permeable to water.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Infiltration. The downward entry of water into soil or other material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, generally expressed in inches per hour. It may be limited either by the infiltration capacity of the soil or by the rate at which water is applied to the surface of the soil.

Leached soil. A soil from which most of the soluble material has been removed from the entire profile or removed from one part of the profile and accumulated in another part.

Litter, forest. A surface layer of loose, organic debris in forests. It consists of freshly fallen or slightly decomposed organic material.

Loam. A soil that consists of a relatively uniform mixture of sand and silt and a somewhat smaller proportion of clay, generally a desirable quality. Specifically, loam is soil material containing 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Mechanical analysis (soils). The percentage of the various sizes of individual mineral particles, or separates, in the soil. Also a laboratory method for determining soil texture.

Mottled soil. Soil irregularly marked with spots of different colors. Mottling in soils generally indicates poor aeration and lack of good drainage.

Natural drainage. Refers to moisture conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Five different classes of natural drainage are recognized in this county.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Pans. A horizon or layer in soil that is strongly compacted, indurated, or very high in clay content. See Hardpan, Fragipan, and Claypan.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod, which is a mass of soil brought about by digging or other disturbance.

Percolation. The downward movement of water through the soil, especially the downward flow of water in saturated or nearly saturated soil.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. The terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Porosity, soil. The degree to which the soil mass is permeated with pores or cavities.

Reaction, soil. The degree of acidity or alkalinity of a soil expressed in either pH value or in words, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Renovation of pastures. Method for restoring soils used for pasture or hay to higher productivity by cultivating carefully, generally with a field cultivator or similar tool, so that the tillage will not cause erosion. The soil is then limed, fertilized, and reseeded with a suitable mixture of grasses and legumes.

Residual soil. Soil formed from material weathered from the underlying consolidated rock.

Runoff. Water that flows off the surface of the soil without sinking in.

Sand. See Texture, soil.

Sedimentary rock. A rock mostly composed of particles deposited from suspension in water. The chief sedimentary rocks are sandstone, shale, limestone, and conglomerate.

Shale. A sedimentary rock formed by hardening of clay deposits.

Silt. See Texture, soil.

Solum. The upper part of the soil profile, above the parent material, in which the processes of soil formation are active. The solum of a mature soil consists of the A and B horizons.

Structure, soil. The arrangement of the primary soil particles into lumps, granules, or other aggregates. Structure is described by grade—*weak, moderate,* or *strong;* that is, the distinctness and durability of the aggregates; by the size of the aggregates—*very fine, fine, medium, coarse,* or *very coarse;* and by their shape—*platy, prismatic, columnar, blocky, granular,* or *crumb.* A soil is described as structureless if there are no observable aggregates. *Structureless* soils may be *massive* (coherent) or *single grain* (noncoherent).

Blocky, angular.—Aggregates are shaped like blocks; they may have flat or rounded surfaces that join at sharp angles.

Blocky, subangular.—Aggregates have some rounded and some flat surfaces; the upper sides are rounded.

Columnar.—Aggregates are prismatic and are rounded at the top.

Crumb.—Aggregates are generally soft, small, porous, and irregular, but tend toward spherical in shape.

Granular.—Roughly spherical, firm, small aggregates that may be either hard or soft, but they are generally more firm and less porous than crumb and without the distinct faces of blocky structure.

Platy.—Aggregates are flaky or platelike.

Subsoil. The soil layers below the plow layer; the B horizon.

Substratum. The soil material below the surface layer and the subsoil; the C or D horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The surface layer or plow layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions of fine particles are as follows: sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay

loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine." The relative sizes of soil particles are as follows:

Clay.—Small mineral soil grains, less than 0.002 millimeter (0.000079 inch) in diameter.

Silt.—Small mineral soil grains ranging from 0.002 millimeter (0.000079 inch) to 0.05 millimeter (0.002 inch) in diameter.

Sand.—Small rock or mineral fragments ranging from 0.05 millimeter (0.002 inch) to 2.0 millimeters (0.079 inch) in diameter.

Tile drain. Concrete or pottery pipe placed at suitable spacings and depths in the soil or subsoil to provide outlets for water.

Till. Unstratified glacial deposits laid down directly by the ice.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of a soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks, at or near the earth's surface, by atmospheric agents, and that result in more or less complete disintegration and decomposition.

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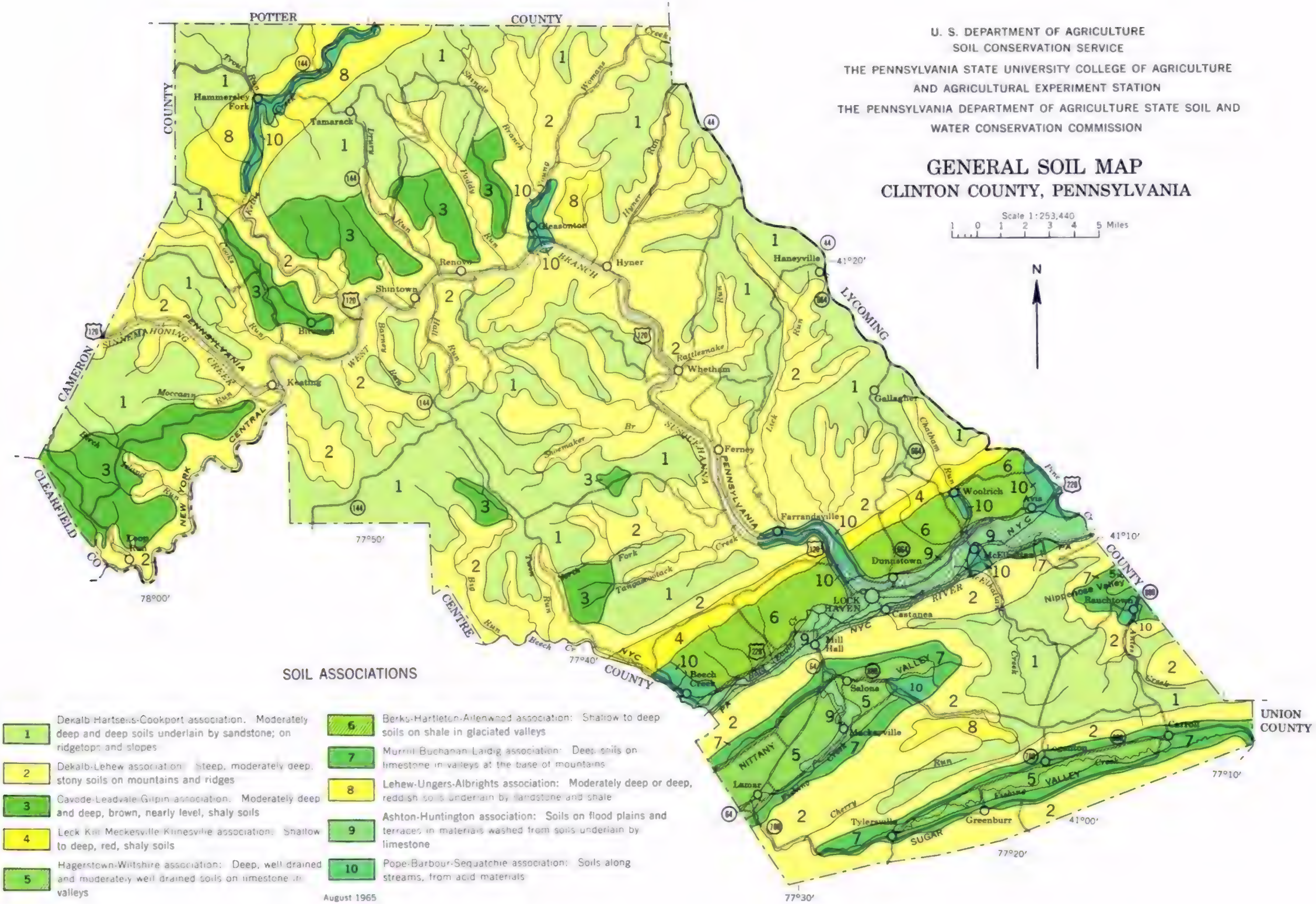
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
THE PENNSYLVANIA STATE UNIVERSITY COLLEGE OF AGRICULTURE
AND AGRICULTURAL EXPERIMENT STATION
THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE STATE SOIL AND
WATER CONSERVATION COMMISSION

GENERAL SOIL MAP
CLINTON COUNTY, PENNSYLVANIA



SOIL ASSOCIATIONS

1 — Dekalb-Hartsells-Cookport association: Moderately deep and deep soils underlain by sandstone; on ridgetops and slopes

2 — Dekalb-Lehew association: Steep, moderately deep, stony soils on mountains and ridges

3 — Cavode-Leadvale-Gilpin association: Moderately deep and deep, brown, nearly level, shaly soils

4 — Leck Kill-Meckesville-Klinesville association: Shallow to deep, red, shaly soils

5 — Hagerstown-Wiltshire association: Deep, well drained and moderately well drained soils on limestone in valleys

6 — Berks-Hartleton-Allenwood association: Shallow to deep soils on shale in glaciated valleys

7 — Murrill-Buchanan-Laidig association: Deep soils on limestone in valleys at the base of mountains

8 — Lehew-Ungers-Albrights association: Moderately deep or deep, reddish soils underlain by sandstone and shale

9 — Ashton-Huntington association: Soils on flood plains and terraces in materials washed from soils underlain by limestone

10 — Pope-Barbour-Sequatchie association: Soils along streams, from acid materials

August 1965

INDEX TO MAP SHEETS
CLINTON COUNTY, PENNSYLVANIA

Scale 1:253,440
1 0 1 2 3 4 5 Miles

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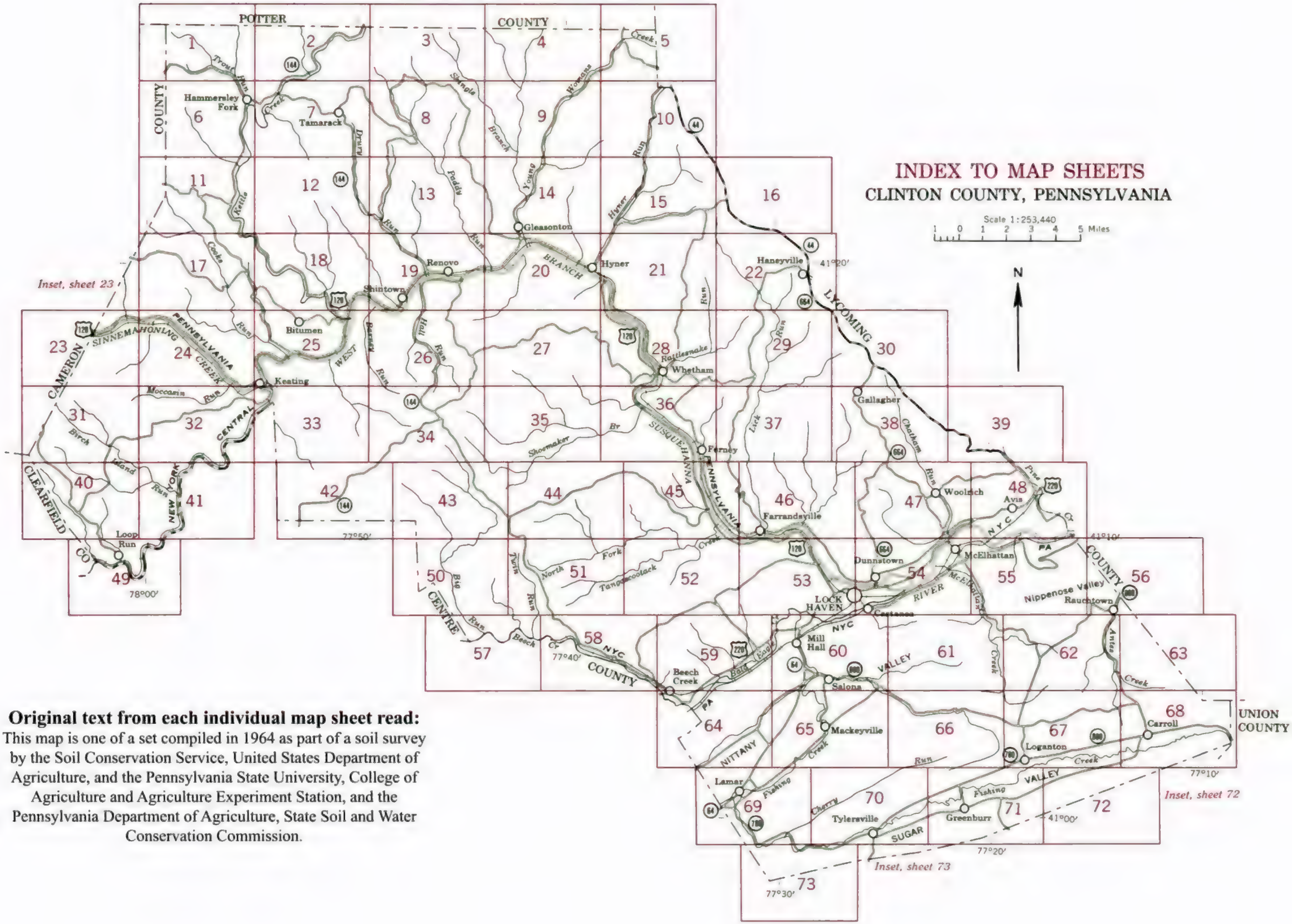


Original text from each individual map sheet read:

This map is one of a set compiled in 1964 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University, College of Agriculture and Agriculture Experiment Station, and the Pennsylvania Department of Agriculture, State Soil and Water Conservation Commission.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CLINTON COUNTY, PENNSYLVANIA

PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE
AND AGRICULTURAL EXPERIMENT STATION
PENNSYLVANIA DEPARTMENT OF AGRICULTURE, STATE SOIL AND
WATER CONSERVATION COMMISSION

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Symbols without a slope letter are those of nearly level soils, such as Atkins silt loam, or of land types, such as Strip mines, that have considerable range of slope. A final number, 2 or 3, in the symbol shows that the soil is moderately or severely eroded.

SYMBOL	NAME
AbB	Albrights silt loam, 3 to 8 percent slopes
AbB2	Albrights silt loam, 8 to 15 percent slopes, moderately eroded
AdA	Allenwood fine sandy loam, 0 to 5 percent slopes
AgB	Allenwood gravelly silt loam, 3 to 8 percent slopes
AgB2	Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded
AgC	Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded
AgC2	Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded
AnB	Andover gravelly loam, 2 to 8 percent slopes
AnB2	Andover gravelly loam, 2 to 8 percent slopes, moderately eroded
AnC2	Andover gravelly loam, 8 to 15 percent slopes, moderately eroded
AnD2	Andover gravelly loam, 15 to 25 percent slopes, moderately eroded
AoB	Andover very stony loam, 0 to 8 percent slopes
AoC	Andover very stony loam, 8 to 25 percent slopes
As	Ashton silt loam
At	Atkins silt loam
Bb	Barbour fine sandy loam
Bs	Basher fine sandy loam
Bu	Basher silt loam
BwB2	Berks channery silt loam, 3 to 8 percent slopes, moderately eroded
BwC2	Berks channery silt loam, 8 to 15 percent slopes, moderately eroded
BwD	Berks channery silt loam, 15 to 25 percent slopes
BwD2	Berks channery silt loam, 15 to 25 percent slopes, moderately eroded
BwE	Berks channery silt loam, 25 to 35 percent slopes
BwE2	Berks channery silt loam, 25 to 35 percent slopes, moderately eroded
BxB2	Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded
BxC2	Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded
BxD	Berks shaly silt loam, 15 to 25 percent slopes
BxD2	Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded
BxE2	Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded
BzB	Berks--Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded
BzC	Berks--Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded
BzD	Berks--Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded
BzF	Berks--Montevallo channery silt loams, 35 to 100 percent slopes
BzF2	Berks--Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded
BrA2	Brinkerton silt loam, 0 to 5 percent slopes moderately eroded
BuB	Buchanan gravelly loam, 3 to 8 percent slopes
BuB2	Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded
BuC2	Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded
BuC	Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded
BuD2	Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded
BvB	Buchanan very stony loam, 0 to 8 percent slopes
BvC	Buchanan very stony loam, 8 to 25 percent slopes
CaA	Cavode silt loam, 0 to 3 percent slopes
CaB	Cavode silt loam, 3 to 8 percent slopes
ChA	Chenango gravelly loam, 0 to 3 percent slopes
ChB	Chenango gravelly loam, 3 to 8 percent slopes
CmA	Comly silt loam, 0 to 3 percent slopes
CmB2	Comly silt loam, 3 to 8 percent slopes, moderately eroded
CmC2	Comly silt loam, 8 to 15 percent slopes, moderately eroded
CoA	Cookport loam, 0 to 3 percent slopes
CoB	Cookport loam, 3 to 8 percent slopes
CoB2	Cookport loam, 3 to 8 percent slopes, moderately eroded
CoC	Cookport loam, 8 to 15 percent slopes
CpB	Cookport very stony loam, 0 to 8 percent slopes
CpC	Cookport very stony loam, 8 to 25 percent slopes
DaA	Dekalb channery loam, 0 to 3 percent slopes
DaB	Dekalb channery loam, 3 to 8 percent slopes
DaB2	Dekalb channery loam, 3 to 8 percent slopes, moderately eroded
DaC	Dekalb channery loam, 8 to 15 percent slopes
DaC2	Dekalb channery loam, 8 to 15 percent slopes, moderately eroded
DaD	Dekalb channery loam, 15 to 25 percent slopes
DbB	Dekalb very stony soils, 0 to 8 percent slopes
DbC	Dekalb very stony soils, 8 to 25 percent slopes
DbD	Dekalb very stony soils, 25 to 100 percent slopes
GaA	Gilpin silt loam, 0 to 3 percent slopes
GaB	Gilpin silt loam, 3 to 8 percent slopes
GaC	Gilpin silt loam, 8 to 15 percent slopes
GuB2	Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded
HaC2	Hagerstown rocky silt loam, 5 to 15 percent slopes
HaD	Hagerstown rocky silt loam, 15 to 25 percent slopes
HbE	Hagerstown rocky silty clay loam, 25 to 70 percent slopes
HeA	Hagerstown silt loam, 0 to 3 percent slopes
HeA2	Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded
HeB2	Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded
HeC2	Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded
HeD2	Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded
HgB2	Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded
HgC2	Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded
HgC	Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded
HgD	Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded
HmA	Hamleton channery silt loam, 0 to 3 percent slopes
HmB2	Hamleton channery silt loam, 3 to 8 percent slopes, moderately eroded
HmC2	Hamleton channery silt loam, 8 to 15 percent slopes, moderately eroded
HnB	Hartsells channery loam, 0 to 3 percent slopes
HnA2	Hartsells channery loam, 0 to 3 percent slopes, moderately eroded
HnB	Hartsells channery loam, 3 to 8 percent slopes
HnB2	Hartsells channery loam, 3 to 8 percent slopes, moderately eroded
HnC2	Hartsells channery loam, 8 to 15 percent slopes, moderately eroded
HoB	Hartsells very stony loam, 0 to 8 percent slopes
Hu	Huntington fine sandy loam
Hy	Huntington silt loam
HyA	Huntington silt loam, local alluvium, 0 to 3 percent slopes
HyB	Huntington silt loam, local alluvium, 3 to 8 percent slopes
KlC	Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded
KlD	Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded
LaB	Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded
LaC	Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded
LaD	Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded
LbB	Laidig very stony loam, 0 to 8 percent slopes
LbC	Laidig very stony loam, 8 to 25 percent slopes
LeB	Leadvale silt loam, 3 to 8 percent slopes
LeC	Leadvale silt loam, 8 to 15 percent slopes
LfB2	Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded
LfC2	Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded
LfD2	Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded
LfE	Leck Kill channery silt loam, 25 to 35 percent slopes
LfE2	Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded
LmB	Leetonia very stony sandy loam, 0 to 8 percent slopes
LmC	Leetonia very stony sandy loam, 8 to 25 percent slopes
LoB	Lehew very stony loam, 8 to 25 percent slopes
LoF	Lehew very stony loam, 25 to 100 percent slopes
LsA	Lickdale silt loam, 0 to 5 percent slopes
Lv	Lickdale very stony silt loam
Ls	Lindside silt loam
Ma	Made land
MeB2	Meckesville silt loam, 3 to 8 percent slopes, moderately eroded
MeC2	Meckesville silt loam, 8 to 15 percent slopes, moderately eroded
MeD2	Meckesville silt loam, 15 to 25 percent slopes, moderately eroded
Mn	Melvin and Newark silt loams
MoB	Morrison cherty sandy loam, 3 to 8 percent slopes
MuA	Murrill gravelly loam, 0 to 3 percent slopes
MuB2	Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded
MuC2	Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded
MuC	Murrill gravelly loam, 8 to 15 percent slopes, severely eroded
MuD2	Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded
MvB	Murrill very stony loam, 0 to 8 percent slopes
MvC	Murrill very stony loam, 8 to 25 percent slopes
NoA	Nolo silt loam, 0 to 3 percent slopes
NvA	Nolo very stony silt loam, 0 to 8 percent slopes
PaA	Pope loam, fans, 0 to 3 percent slopes
PaB	Pope loam, fans, 3 to 8 percent slopes
Pv	Pope very stony loam
Pu	Purdy silt loam
Rw	Riverwash
Rb	Rubble land
Sa	Sequatchie loam
Sf	Sequatchie fine sandy loam, high
Sv	Stony alluvial land
St	Stony land
Sm	Strip mines
Ty	Tygart silt loam
UnB	Ungers loam, 3 to 8 percent slopes
UnB2	Ungers loam, 3 to 8 percent slopes, moderately eroded
UnC	Ungers loam, 8 to 15 percent slopes
UpB	Upshur silt loam, acid substratum, 2 to 8 percent slopes
WaA	Watson silt loam, 0 to 5 percent slopes
WhA2	Whitwell silt loam, 0 to 5 percent slopes, moderately eroded
WkA	Wiltshire silt loam, 0 to 3 percent slopes
WkA2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded

Soil map constructed 1964 by Cartographic Division, Soil Conservation Service, USDA, from 1959 aerial photographs. Controlled mosaic based on Pennsylvania plane coordinate system, north zone, Lambert conformal conic projection, 1927 North American datum.

CLINTON COUNTY, PENNSYLVANIA

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Dual
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U.S.
- State

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

- School
- Church
- Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Oil wells

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Minor civil divisions

DRAINAGE

Streams

- Perennial
- Intermittent, unclass.

Canals and ditches

Lakes and ponds

- Perennial
- Intermittent

Wells

Springs

Marsh

Wet spot

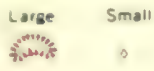
RELIEF

Escarpments

- Bedrock
- Other

Prominent peaks

Depressions



SOIL SURVEY DATA

Soil boundary and symbol

- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gullies

GUIDE TO MAPPING UNITS

[See table 1, p. 20, for the estimated productivity ratings, and table 7, p. 56, for the acreage and proportionate extent of the soils. For the engineering uses of the soils, see the section beginning on p. 33. Dashes indicate the soil was not given a classification in the particular grouping]

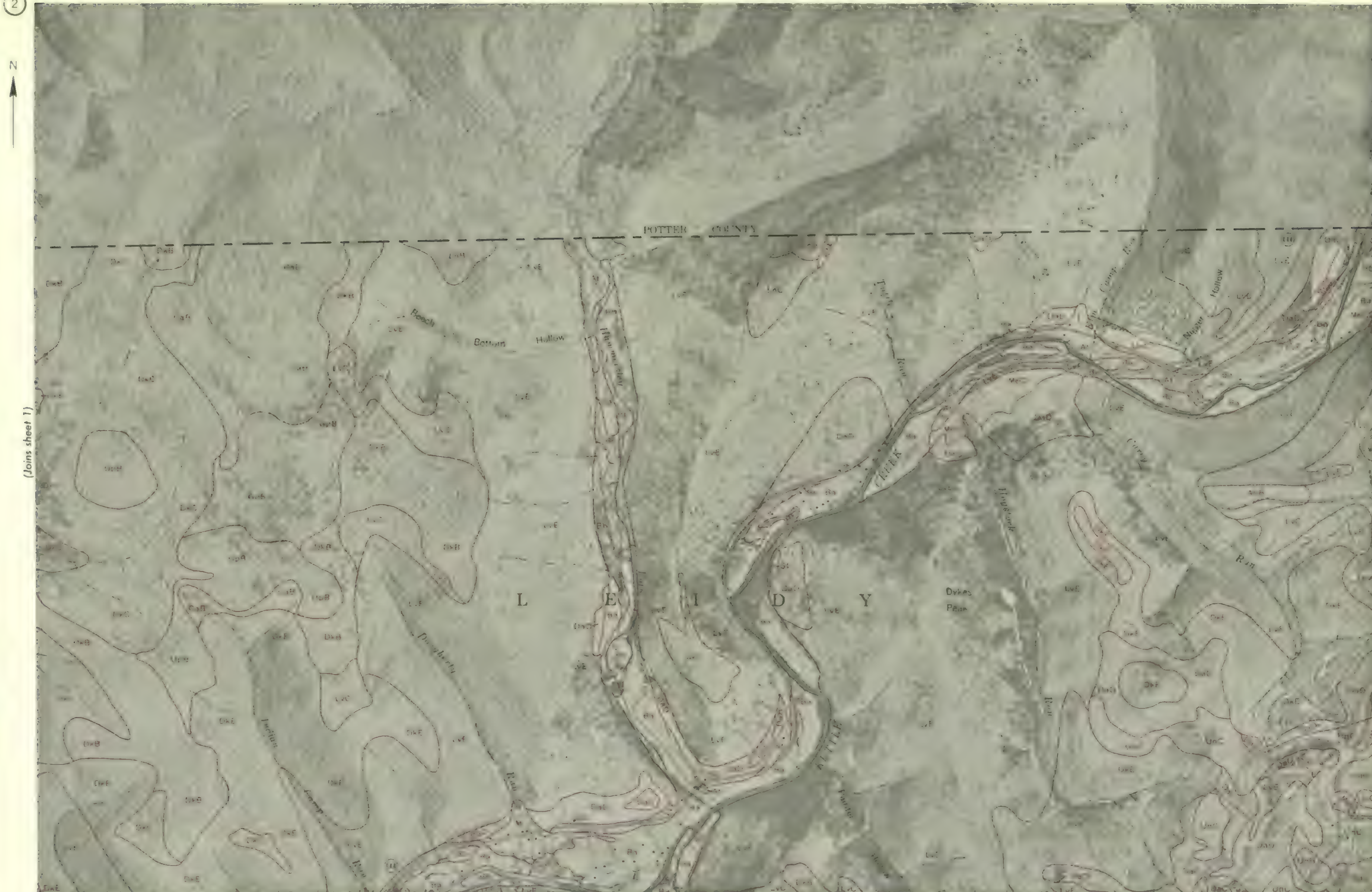
Map symbol	Mapping unit	Page	Capability unit		Woodland group	
			Symbol	Page	Number	Page
AbB	Albrights silt loam, 3 to 8 percent slopes	58	IIe-4	11	9	27
AbC2	Albrights silt loam, 8 to 15 percent slopes, moderately eroded	58	IIIe-3	13	9	27
AfA	Allenwood fine sandy loam, 0 to 5 percent slopes	58	I-2	10	1	24
AgB	Allenwood gravelly silt loam, 3 to 8 percent slopes	59	IIe-2	11	1	24
AgC2	Allenwood gravelly silt loam, 8 to 15 percent slopes, moderately eroded	59	IIIe-2	13	1	24
AgC3	Allenwood gravelly silt loam, 8 to 15 percent slopes, severely eroded	59	IVe-2	15	3	27
AgD3	Allenwood gravelly silt loam, 15 to 25 percent slopes, severely eroded	59	VIe-1	17	3	27
AnB	Andover gravelly loam, 2 to 8 percent slopes	60	IVw-2	16	9	27
AnB2	Andover gravelly loam, 2 to 8 percent slopes, moderately eroded	60	IVw-2	16	9	27
AnC2	Andover gravelly loam, 8 to 15 percent slopes, moderately eroded	60	IVw-2	16	9	27
AnD2	Andover gravelly loam, 15 to 25 percent slopes, moderately eroded	60	VIe-4	17	9	27
AoB	Andover very stony loam, 0 to 8 percent slopes	60	VIIs-2	19	9	27
AoC	Andover very stony loam, 8 to 25 percent slopes	60	VIIs-2	19	9	27
As	Ashton silt loam	61	I-3	10	2	26
At	Atkins silt loam	61	IIIw-3	15	11	28
Ba	Barbour fine sandy loam	62	I-4	10	1	24
Bb	Basher fine sandy loam	62	IIw-3	12	9	27
Bc	Basher silt loam	62	IIw-3	12	9	27
BeB2	Berks channery silt loam, 3 to 8 percent slopes, moderately eroded	63	IIe-5	11	5	27
BeC2	Berks channery silt loam, 8 to 15 percent slopes, moderately eroded	63	IIIe-4	14	5	27
BeD	Berks channery silt loam, 15 to 25 percent slopes	63	IVe-4	16	5	27
BeD2	Berks channery silt loam, 15 to 25 percent slopes, moderately eroded	63	IVe-4	16	5	27
BeE	Berks channery silt loam, 25 to 35 percent slopes	63	VIe-2	17	7	27
BeE2	Berks channery silt loam, 25 to 35 percent slopes, moderately eroded	63	VIe-2	17	7	27
BkB2	Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded	63	IIe-5	11	5	27
BkC2	Berks shaly silt loam, 8 to 15 percent slopes, moderately eroded	64	IIIe-4	14	5	27
BkD	Berks shaly silt loam, 15 to 25 percent slopes	64	IVe-4	16	5	27
BkD2	Berks shaly silt loam, 15 to 25 percent slopes, moderately eroded	64	IVe-4	16	5	27
BkE2	Berks shaly silt loam, 25 to 35 percent slopes, moderately eroded	64	VIe-2	17	7	27
BmB3	Berks-Montevallo channery silt loams, 3 to 8 percent slopes, severely eroded	64	IVe-4	16	12	28
BmC3	Berks-Montevallo channery silt loams, 8 to 15 percent slopes, severely eroded	64	VIe-2	17	12	28
BmD3	Berks-Montevallo channery silt loams, 15 to 35 percent slopes, severely eroded	64	VIIe-1	18	12	28
BmF	Berks-Montevallo channery silt loams, 35 to 100 percent slopes	65	VIIe-1	18	12	28
BmF2	Berks-Montevallo channery silt loams, 35 to 100 percent slopes, moderately eroded	65	VIIe-1	18	12	28
BrA2	Brinkerton silt loam, 0 to 5 percent slopes, moderately eroded	65	IVw-1	16	11	28
BuB	Buchanan gravelly loam, 3 to 8 percent slopes	65	IIe-4	11	9	27
BuB2	Buchanan gravelly loam, 3 to 8 percent slopes, moderately eroded	66	IIe-4	11	9	27
BuC2	Buchanan gravelly loam, 8 to 15 percent slopes, moderately eroded	66	IIIe-3	13	9	27
BuC3	Buchanan gravelly loam, 8 to 15 percent slopes, severely eroded	66	IVe-3	15	9	27
BuD2	Buchanan gravelly loam, 15 to 25 percent slopes, moderately eroded	66	IVe-3	15	9	27
BvB	Buchanan very stony loam, 0 to 8 percent slopes	66	VIs-2	18	9	27
BvC	Buchanan very stony loam, 8 to 25 percent slopes	66	VIs-2	18	9	27
CaA	Cavode silt loam, 0 to 3 percent slopes	67	IIIw-1	14	9	27
CaB	Cavode silt loam, 3 to 8 percent slopes	67	IIIw-2	15	9	27
ChA	Chenango gravelly loam, 0 to 3 percent slopes	67	IIs-2	12	1	24
ChB	Chenango gravelly loam, 3 to 8 percent slopes	68	IIe-2	11	1	24
CmA	Comly silt loam, 0 to 3 percent slopes	68	IIw-2	12	9	27
CmB2	Comly silt loam, 3 to 8 percent slopes, moderately eroded	68	IIe-4	11	9	27
CmC2	Comly silt loam, 8 to 15 percent slopes, moderately eroded	69	IIIe-3	13	9	27
CoA	Cookport loam, 0 to 3 percent slopes	69	IIw-2	12	9	27
CoB	Cookport loam, 3 to 8 percent slopes	69	IIe-4	11	9	27
CoB2	Cookport loam, 3 to 8 percent slopes, moderately eroded	69	IIe-4	11	9	27
CoC	Cookport loam, 8 to 15 percent slopes	70	IIIe-3	13	9	27
CpB	Cookport very stony loam, 0 to 8 percent slopes	70	VIs-2	18	9	27
CpC	Cookport very stony loam, 8 to 25 percent slopes	70	VIs-2	18	9	27
DaA	Dekalb channery loam, 0 to 3 percent slopes	70	IIs-4	13	5	27
DaB	Dekalb channery loam, 3 to 8 percent slopes	70	IIe-6	11	5	27
DaB2	Dekalb channery loam, 3 to 8 percent slopes, moderately eroded	71	IIe-6	11	5	27
DaC	Dekalb channery loam, 8 to 15 percent slopes	71	IIIe-5	14	5	27
DaC2	Dekalb channery loam, 8 to 15 percent slopes, moderately eroded	71	IIIe-5	14	5	27
DaD	Dekalb channery loam, 15 to 25 percent slopes	71	IVe-5	16	5	27
DkB	Dekalb very stony soils, 0 to 8 percent slopes	71	VIs-3	18	5	27
DkC	Dekalb very stony soils, 8 to 25 percent slopes	71	VIs-3	18	5	27
DkE	Dekalb very stony soils, 25 to 100 percent slopes	72	VIIs-1	18	8	27
GpA	Gilpin silt loam, 0 to 3 percent slopes	72	IIs-1	12	5	27
GpB	Gilpin silt loam, 3 to 8 percent slopes	72	IIe-5	11	5	27
GpC	Gilpin silt loam, 8 to 15 percent slopes	72	IIIe-4	14	5	27
GuB2	Guthrie silt loam, dark surface, 3 to 8 percent slopes, moderately eroded	73	IVw-2	16	10	28
HaC	Hagerstown rocky silt loam, 5 to 15 percent slopes	73	IVes-1	17	2	26
HaD	Hagerstown rocky silt loam, 15 to 25 percent slopes	73	VIes-1	17	2	26
HcE	Hagerstown rocky silty clay loam, 25 to 70 percent slopes	73	VIIes-1	18	2	26
HeA	Hagerstown silt loam, 0 to 3 percent slopes	73	I-1	10	2	26
HeA2	Hagerstown silt loam, 0 to 3 percent slopes, moderately eroded	74	IIe-1	10	2	26
HeB2	Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded	74	IIe-1	10	2	26
HeC2	Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded	74	IIIe-1	13	2	26
HeD2	Hagerstown silt loam, 15 to 25 percent slopes, moderately eroded	74	IVe-1	15	2	26
HgB2	Hagerstown silty clay loam, 3 to 8 percent slopes, moderately eroded	74	IIIe-6	14	2	26
HgC2	Hagerstown silty clay loam, 8 to 15 percent slopes, moderately eroded	74	IIIe-6	14	2	26

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit: Symbol	Capability unit: Page	Woodland group: Number	Woodland group: Page
HgC3	Hagerstown silty clay loam, 8 to 15 percent slopes, severely eroded	75	IVe-6	16	4	27
HgD3	Hagerstown silty clay loam, 15 to 25 percent slopes, severely eroded	75	VIe-3	17	4	27
HhA	Hartleton channery silt loam, 0 to 3 percent slopes	75	IIs-1	12	5	27
HhB2	Hartleton channery silt loam, 3 to 8 percent slopes, moderately eroded	75	IIe-5	11	5	27
HhC2	Hartleton channery silt loam, 8 to 15 percent slopes, moderately eroded	75	IIIe-4	14	5	27
HrA	Hartsells channery loam, 0 to 3 percent slopes	76	I-2	10	1	24
HrA2	Hartsells channery loam, 0 to 3 percent slopes, moderately eroded	76	IIe-2	11	1	24
HrB	Hartsells channery loam, 3 to 8 percent slopes	76	IIe-2	11	1	24
HrB2	Hartsells channery loam, 3 to 8 percent slopes, moderately eroded	76	IIe-2	11	1	24
HrC2	Hartsells channery loam, 8 to 15 percent slopes, moderately eroded	76	IIIe-2	13	1	24
HsB	Hartsells very stony loam, 0 to 8 percent slopes	77	VIs-2	18	1	24
Ht	Huntington fine sandy loam	77	I-3	10	2	26
Hu	Huntington silt loam	77	I-3	10	2	26
HvA	Huntington silt loam, local alluvium, 0 to 3 percent slopes	77	I-1	10	2	26
HvB	Huntington silt loam, local alluvium, 3 to 8 percent slopes	77	IIe-1	10	2	26
KcD3	Klinesville channery silt loam, 15 to 25 percent slopes, severely eroded	78	VIIe-1	18	5	27
KcE3	Klinesville channery silt loam, 25 to 80 percent slopes, severely eroded	78	VIIe-1	18	8	27
LaB2	Laidig gravelly loam, 3 to 8 percent slopes, moderately eroded	78	IIe-2	11	1	24
LaC2	Laidig gravelly loam, 8 to 15 percent slopes, moderately eroded	79	IIIe-2	13	1	24
LaD2	Laidig gravelly loam, 15 to 25 percent slopes, moderately eroded	79	IVe-2	15	1	24
LdB	Laidig very stony loam, 0 to 8 percent slopes	79	VIs-2	18	1	24
LdC	Laidig very stony loam, 8 to 25 percent slopes	79	VIs-2	18	1	24
LeB	Leadvale silt loam, 3 to 8 percent slopes	79	IIe-4	11	9	27
LeC	Leadvale silt loam, 8 to 15 percent slopes	80	IIIe-3	13	9	27
LkB2	Leck Kill channery silt loam, 3 to 8 percent slopes, moderately eroded	80	IIe-5	11	5	27
LkC2	Leck Kill channery silt loam, 8 to 15 percent slopes, moderately eroded	80	IIIe-4	14	5	27
LkD2	Leck Kill channery silt loam, 15 to 25 percent slopes, moderately eroded	80	IVe-4	16	5	27
LkE	Leck Kill channery silt loam, 25 to 35 percent slopes	81	VIe-2	17	7	27
LkE2	Leck Kill channery silt loam, 25 to 35 percent slopes, moderately eroded	81	VIe-2	17	7	27
LnB	Leetonia very stony sandy loam, 0 to 8 percent slopes	81	VIIs-1	18	6	27
LnC	Leetonia very stony sandy loam, 8 to 25 percent slopes	81	VIIs-1	18	6	27
LvC	Lehew very stony loam, 8 to 25 percent slopes	82	VIs-3	18	5	27
LvE	Lehew very stony loam, 25 to 100 percent slopes	82	VIIs-1	18	8	27
LwA	Lickdale silt loam, 0 to 5 percent slopes	82	IVw-2	16	11	28
Lx	Lickdale very stony silt loam	82	VIIs-2	19	11	28
Lz	Lindside silt loam	83	IIw-3	12	10	28
Ma	Made land	83	-----	--	14	28
MeB2	Meckesville silt loam, 3 to 8 percent slopes, moderately eroded	83	IIe-2	11	1	24
MeC2	Meckesville silt loam, 8 to 15 percent slopes, moderately eroded	83	IIIe-2	13	1	24
MeD2	Meckesville silt loam,,15 to 25 percent slopes, moderately eroded	84	IVe-2	15	1	24
Mn	Melvin and Newark silt loams	84	IIIw-3	15	11	28
MoB	Morrison cherty sandy loam, 3 to 8 percent slopes	85	IIs-3	13	2	26
MuA	Murrill gravelly loam, 0 to 3 percent slopes	86	I-1	10	2	26
MuB2	Murrill gravelly loam, 3 to 8 percent slopes, moderately eroded	86	IIe-1	10	2	26
MuC2	Murrill gravelly loam, 8 to 15 percent slopes, moderately eroded	86	IIIe-1	13	2	26
MuC3	Murrill gravelly loam, 8 to 15 percent slopes, severely eroded	86	IVe-1	15	4	27
MuD2	Murrill gravelly loam, 15 to 25 percent slopes, moderately eroded	86	IVe-1	15	2	26
MvB	Murrill very stony loam, 0 to 8 percent slopes	86	VIs-1	18	2	26
MvC	Murrill very stony loam, 8 to 25 percent slopes	87	VIs-1	18	2	26
NoA	Nolo silt loam, 0 to 3 percent slopes	88	IVw-1	16	11	28
NsA	Nolo very stony silt loam, 0 to 8 percent slopes	88	VIIs-2	19	11	28
PoA	Pope loam, fans, 0 to 3 percent slopes	88	I-4	10	1	24
PoB	Pope loam, fans, 3 to 8 percent slopes	88	IIe-2	11	1	24
Ps	Pope very stony loam	88	VIs-2	18	1	24
Pu	Purdy silt loam	89	IVw-1	16	11	28
Ra	Riverwash	89	VIIIs-1	19	14	28
Rb	Rubble land	89	VIIIs-1	19	14	28
Sa	Sequatchie loam	90	I-2	10	1	24
Sf	Sequatchie fine sandy loam, high	90	I-2	10	1	24
Sn	Stony alluvial land	90	VIIIs-1	19	14	28
So	Stony land	90	VIIIs-1	19	14	28
St	Strip mines	90	-------	--	13	28
Ty	Tygart silt loam	91	IIIw-1	14	9	27
UnB	Ungers loam, 3 to 8 percent slopes	91	IIe-2	11	1	24
UnB2	Ungers loam, 3 to 8 percent slopes, moderately eroded	91	IIe-2	11	1	24
UnC	Ungers loam, 8 to 15 percent slopes	92	IIIe-2	13	1	24
UpB	Upshur silt loam, acid substratum, 2 to 8 percent slopes	92	IIe-2	11	1	24
WaA	Watson silt loam, 0 to 5 percent slopes	92	IIw-2	12	9	27
WhA2	Whitwell silt loam, 0 to 5 percent slopes, moderately eroded	93	IIw-2	12	9	27
WtA	Wiltshire silt loam, 0 to 3 percent slopes	93	IIw-1	12	10	28
WtB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded	94	IIe-3	11	10	28


POTTER COUNTY
CAMERON COUNTY
L E I D Y
Left Fork
Right Fork
Fork
Branch
Green
Calhoun
Bowleyes Point
Van
Oak
Hollow
Swimmerson
John
Fork Hill
Wykoff
Trout
DkE
DkB
DkC
LvC
LvE
HsB
AbB
CpB
Sn
N
(Joins sheet 2)
(Joins sheet 6)
0 ½ 1 Mile
Scale 1:20 000
0 5000 Feet

(2)



(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 7)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

N

POTTER COUNTY

L E I D Y

C H A P M A N

Stamp Hollow

Tin Can Hollow

Shingle Branch

Tegerman Hollow

Renz Hollow

Stephens Hollow

Marsh Run

(Joins sheet 2)

(Joins sheet 4)

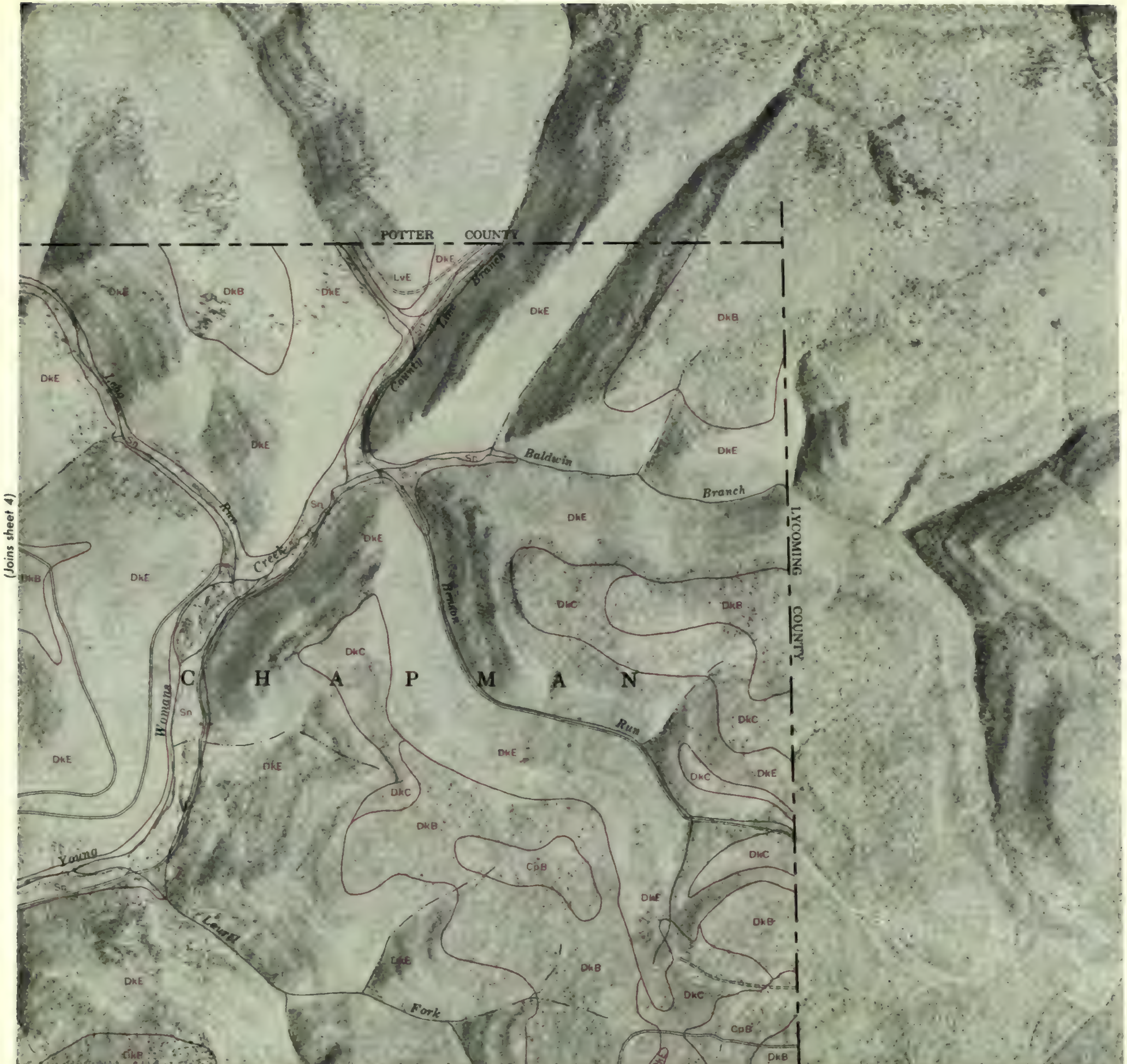
(Joins sheet 8)

0 ½ 1 Mile Scale 1 20000 0 5000 Feet


4
N
POTTER COUNTY
C H A P M A N
Little Greenlick Run
Greenlick Run
Long Hollow
Sn Creek
Ingram Hollow
Run
Geyser Hollow
Young Woman Creek
Ridge
Windfall Run
LvE
LvC
DkE
DkB
DkC
CoB
CoE
LnB
LnC
Sn
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 9)
0 ½ 1 Mile
Scale 1 20 000
0 5000 Feet

N

(Joins sheet 4)



(Joins sheet 10)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 6

(6)

N

(Joins sheet 1)

(Joins sheet 7)

(Joins sheet 11)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 2)

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 12)

(Joins sheet 3)

(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 13)

N

L E I D Y

C H A P M A N

Austin Hollow
Merriman Hollow
Ginseng Hollow
Branch
Paddy
Hensel Fork
Rock Hollow
Tub Hollow
Dark
Ridge
Run

DaB DaC DaD DkB DkC DkE LvC LvE MeC2 MeB2 AbB CpB GpB GoC UnB CoB Sn At

0 ½ 1 Mile

Scale 1 20 000

0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 9

(Joins sheet 5)

(Joins sheet 9)

(Joins sheet 15)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

(Joins sheet 6)

11

(Joins sheet 12)

(Joins sheet 17)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(12)

(Joins sheet 7)

N

(Joins sheet 11)

(Joins sheet 13)

(Joins sheet 18)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 13

(Joins sheet 8)

13

N

(Joins sheet 12)

(Joins sheet 14)

L E I D Y

S U M M E R S O N

C H A P M A N

N O Y E S

Devils Elbow Hollow

Dark Hollow Run

Hudlick Run

Sickle Hollow

Paidy

Van

Dugan Hollow

Slab Run

Coal Hill

Sandy Run

Drury Run

Woodley Run

Stony Run

Hollow Run

Weaver Run

Renovo Reservoir

MINE SPOIL

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 19)

(Joins sheet 9)

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 20)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 10)

15

N

C H A P M A N

G R U G A N

Left Run
Spring Run
Run
Hyner Run
Sn Branch Right
Log Hollow
Fork Run
Bear Pen Hollow
Hyner Run
Hyner Branch East
Cleveland Hollow
Post Dran

DkB DkC DkE NsA LnB LnC CpB NoA HrA HrB LvE MeC2 MeD2 LuC BaD BdA DaD DaB DaA CoB CpC

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 21)


16
N
(Joins sheet 15)
(Joins sheet 22)
LYCOMING COUNTY
GRUGAN
HYNER MOUNTAIN
GALLAHER
DkB
CpB
DaB
DkE
DkC
DaB2
DaA
HrA
HrB
CaA
CaB
CoA
CpC
Sn
0
½
1 Mile
Scale 1:20 000
0
5000 Feet

(Joins sheet 11)

17

(Joins inset, sheet 23)

(Joins sheet 18)

(Joins sheet 24)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

18

(Joins sheet 12)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 25)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 13)

N

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 26)

(Joins sheet 14)

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 27)

N

North Bend

Skunk Hollow

SUMMERSON MOUNTAIN

SUSQUEHANNA RIVER

WEST BRANCH

CHAPMAN

Renovo

Farwell

Paddy Run Station

Tamarack Island

Hyner

Caldwell Hollow

BOBBS

NOYES

McCloskey Run

Little McCloskey Run

Big Hollow

Schoolhouse

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

(Joins sheet 15)

21

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 28)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(22)

(Joins sheet 16)

N

GRUGAN MOUNTAIN

THUNDER

GALLAHER

Robbins Run

Wright Run

Branch

Haneyville

LYCOMING COUNTY

CLAY MINE

(Joins sheet 21)

(Joins sheet 29) | (Sh 30)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

24

(Joins sheet 17)

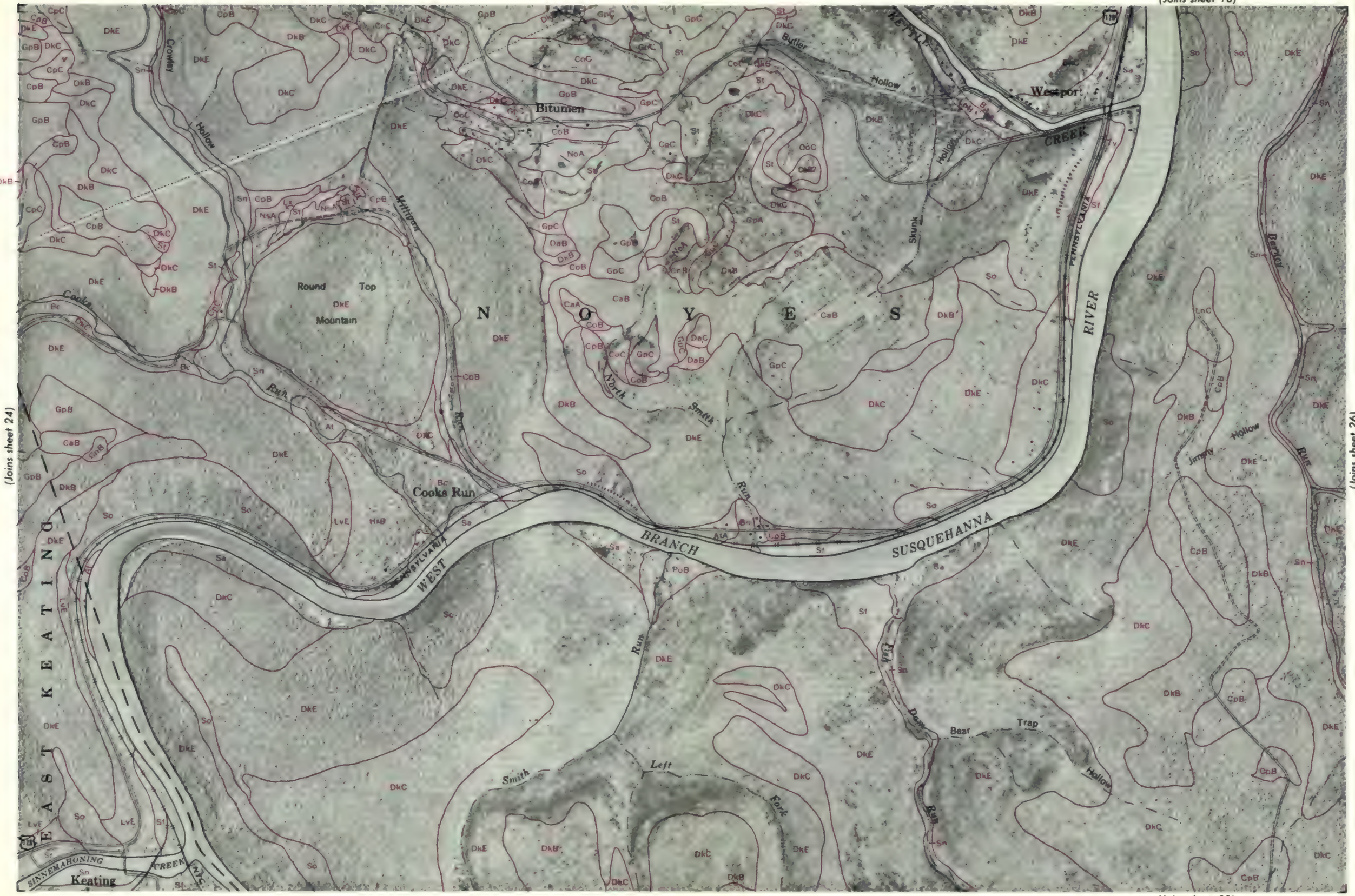
(Joins sheet 32)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 18)

25

N



(Joins sheet 24)

(Joins sheet 26)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 33)

(26)

N

(Joins sheet 19)

WEST BRANCH SUSQUEHANNA RIVER

PENNSYLVANIA

South Renovo Reservoir

Stink Hollow

Dry Run

Hall Run

Bogus Hollow

First Fork

Second Fork

Drake Hollow

Diamond Rock Hollow

Laurely Water Trough Hollow

Lick Fork

Mucks Hollow

Gravel Run

Barney Run

N O Y E S

High Knob

DkB DkC DkE CpB GpB UnB So Sn Sp St

(Joins sheet 25)

(Joins sheet 27)

(Joins sheet 34)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 20)

N

Boggs Hollow

NOYES

CHAPMAN

Steps Run

Sled Road Hollow

Bentzinger Hollow

Wertz Run

Crabapple Run

GRUGAN

Mill Run

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 35)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 21)

N

CHAPMAN

GALLAHER

WEST BRANCH SUSQUEHANNA RIVER

GRUGAN

Ritchie

Whetham

Sugar Camp

McCloskey Island

Ritchie Run

Green Run

Grandpap Hollow

Rattlesnake Run

Smokes Hollow

Pennsylvania

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 36)

0 ½ 1 Mile

Scale 1. 20 000

0 5000 Feet

(Joins sheet 22)

N

(Joins sheet 28)

(Joins sheet 30)

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

(Joins sheet 37)

(30)

(Sh 22)

N

(Joins sheet 29)

(Joins sheet 38)

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

(Joins sheet 23)

N

EAST KEATING

WEST KEATING

CAMERON COUNTY

CLEARFIELD CO.

Birch Island Run

Little Birch Island Run

Birch Island Run

Trout Run

(Joins sheet 32)

(Joins sheet 40)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

32

(Joins sheet 24)

N

(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 41)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 25)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 42)

33

N

Keating

EAST KEATING

NOYES

BEECH CREEK

PENNSYLVANIA

CENTRE COUNTY

CENTRAL -RIVER-

SUSQUEHANNA -BRANCH- WEST

NEW YORK

Jews Run

Spring Creek

Run

Splash Dam

Hollow

Fork

Dennison

Run

Dam

Proctor Hollow

Burns Hollow

Log Hollow

Run

Packer Run

Owl Run

J C Branch

Bear Willow Camps

Deer Lick Camp

DkB DkC DkE CdB So Sn AbB

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(34)

(Joins sheet 26)

N

(Joins sheet 33)

(Joins sheet 35)

N O Y E S

B E E C H C R E E K

Dennison Fork

Proctor Hollow

Ridge Barneys

Gravel Lick

Camp Chestnut Hill

State Camp

Ralphton Camp

Little Beaver Camp

Tyro Camp

Clendinin Branch

Big Run

Sawmp

Branch

COFFIN ROCKS A FIRE TOWER

(Joins sheet 42) | (Joins sheet 43)

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

(Joins sheet 27)

N

(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 43) | (Joins sheet 44)

0 ½ 1 Mile

Scale 1 20 000

0 5000 Feet

(36)

(Joins sheet 28)

N

(Joins sheet 35)

(Joins sheet 37)

Glen Union

WEST BRANCH SUSQUEHANNA RIVER

GRUGAN

Ferney

COLEBROOK

Hollow Run

Run

Eagleton Run

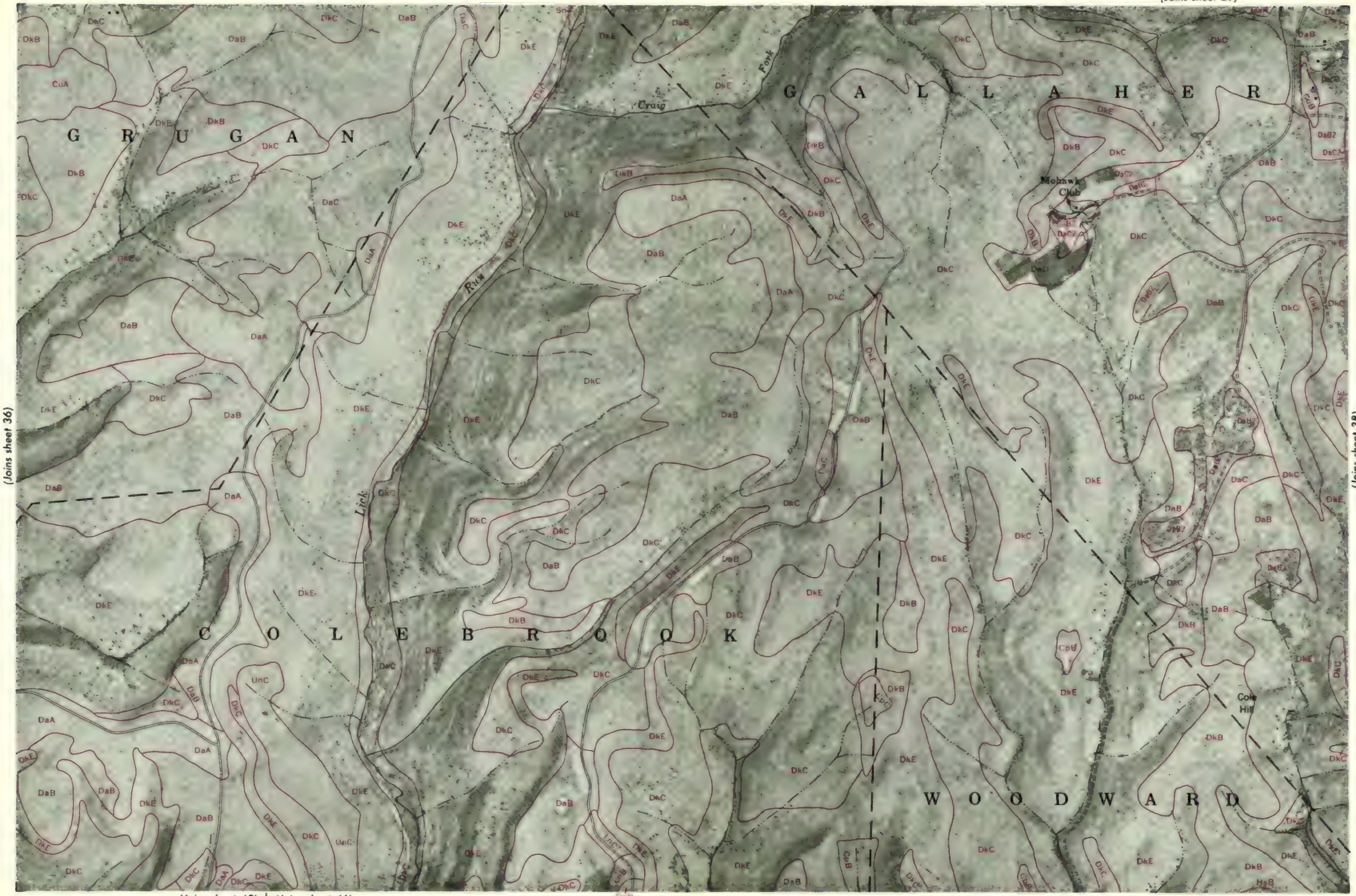
McCloskey Run

Rim

(Joins sheet 44) | (Joins sheet 45)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 29)



(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 45) | (Joins sheet 46)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Joins sheet 30)

N

Gallagher

Caldwell Church

Chatham Run

GALLAGHER

LYCOMING COUNTY

PINE CREEK

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 46) | (Joins sheet 47)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

N

(Joins sheet 38)

(Joins sheet 47) | (Joins sheet 48)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

(Joins sheet 31)

40

N

(Joins sheet 41)

(Joins sheet 49)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 32)

(Joins sheet 40)

(Joins sheet 49)

N

WEST KEATING

EAST KEATING

SUSQUEHANNA RIVER

WEST BRANCH SUSQUEHANNA RIVER

NEW YORK CENTRAL

CENTRE COUNTY

Black Stump Run

McCormack Hill

Birch Run

Little Birch Run

Inland Run

Sugarcamp Run

Leaning Pine Run

Rough Run

Scale 1: 20 000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 33) | (Joins sheet 34)

42

N

GENTRE COUNTY

B E E C H C R E E K

Bloody Run Camp

Burns Run Camp

Sweet A Camp

Dry Run Camp

Panther Hollow

Run

Branch

Big

CENTRE COUNTY

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

(Joins sheet 43)

(Joins sheet 34) | (Joins sheet 35)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 50)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 35) | (Joins sheet 36)

N

N O Y E S

G R U G A N

B E E C H C R E E K

B A L D E A G L E

Shoemaker Branch

Branch

Torkiln

Eagleton Fields

Mill Branch

(Joins sheet 43)

(Joins sheet 45)

(Joins sheet 51)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 36) | (Joins sheet 37)

45

N

GRUGAN

COLEBROOK

BALD EAGLE

WEST BRANCH SUSQUEHANNA RIVER

Holland Run

Boiler Run

Hollow

Fork

Tangascootack

East Fork

Run

Creek

PENNSYLVANIA

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 52)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 37) | (Joins sheet 38)

N

C O L E B R O O K

G A L L A H E R

W O O D W A R D

Bear Mountain

Farrandsville

Queens Run

BALD EAGLE

ALLISON

WEST BRANCH SUSQUEHANNA RIVER

PENNSYLVANIA

West Branch

Link Run

Whiskey Run

Queens Run

Middle Branch

East Branch

Crooked Run

CLAY MINE

MINE SINKS

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 53)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet


47
(Joins sheet 38) | (Joins sheet 39)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 54)
N
G A L L A H E R
P I N E
C R E E K
D U N N S T A B L E
W O O D W A R D
W A Y N E
Woolrich
Swissdale
Little Plum Run
Chatham Run
WEST BRANCH SUSQUEHANNA RIVER
0 ½ 1 Mile
Scale 1:20 000
0 5000 Feet

48

(Joins sheet 39)

N

(Joins sheet 47)

P I N E C R E E K

W A Y N E

Avis

Charlton

STEEL MILL

Sulphur Run

PINE CREEK

LYCOMING COUNTY PINE CREEK

WEST BRANCH SUSQUEHANNA RIVER

W BR SUSQUEHANNA RIVER

CANAL

NEW YORK CENTRAL

PENNSYLVANIA

WAYNE

(Joins sheet 55)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

(Joins sheet 40) | (Joins sheet 41)

N

WEST KEATING

Coleman Siding

Loop Run

Spruce

Little Bowyer Run

Three Runs

CLEARFIELD COUNTY

CENTRE COUNTY

WEST CENTRE COUNTY

SUSQUEHANNA RIVER

NEW YORK CENTRAL RR

BRANCH

MINE SPOIL

Lower

Loop

DkB DkC DkE GpB GpC CoB LeB LeC LdC St So Sb Bb

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 43)

(Joins sheet 51)

(Joins sheet 57)

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 51

(Joins sheet 44)

N

(Joins sheet 50)

(Joins sheet 52)

B E E C H C R E E K

B A L D E A G L E

Bear Swamp

North Fork

Tangascootack Creek

Tangascootack Creek Branch

Twin Run

Monument Run

(Joins sheet 57) | (Joins sheet 58)

Scale 1 20 000

0 ½ 1 Mile

0 5000 Feet

(52)

(Joins sheet 45)

N

(Joins sheet 51)

(Joins sheet 53)

B A L D E A G L E

B E E C H C R E E K

North Fork

Tamarack Run

Bird Run

Round Top

Laurel Run Church

(Joins sheet 58) | (Joins sheet 59)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Joins sheet 46)

(Joins sheet 52)

(Joins sheet 34)

(Joins sheet 59) | (Joins sheet 60)

WEST BR SUSQUEHANNA RIVER

WEST BRANCH SUSQUEHANNA RIVER

Sugar Run

Plumtree Run

Eagle Creek

Bald Eagle Creek

Pennsylvania Canal

B A L D E A G L E

W O O D W A R D

Z O

LOCK HAVEN

C A S T A N E A

Lockport

Flemington

LOCK HAVEN STATE COLLEGE

PENNSYLVANIA

OLD

CEMETERY

N

1 Mile

Scale 1:20 000

5000 Feet

54

(Joins sheet 47)

N

(Joins sheet 53)

(Joins sheet 55)

D U N N S T A B L E

W O O D W A R D

Dunnstown

McElhattan

Youngdale

McElhattan

Great Island

LOCK HAVEN

LOCK HAVEN MUNICIPAL AIRPORT

GRAVEL PIT

GRAVEL PIT

Castanea

W A Y N E

B A L D E A G L E M O U N T A I N

WEST BRANCH

SUSQUEHANNA RIVER

PENNSYLVANIA CENTRAL

NEW YORK CENTRAL

BALD EAGLE CREEK

(Joins sheet 60) | (Joins sheet 61)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 48)

N

PINE CREEK

WEST BR SUSQUEHANNA RIVER

PENNSYLVANIA

NEW YORK CENTRAL

Browns

Pine

Wayne School No 2

Hunter Run

W A Y N E M O U N T A I N

B A L D E A G L E

C R A W F O R D

Hublersburg

Nippenose Valley

Lock Haven Reservoir

(Joins sheet 54)

(Joins sheet 56)

(Joins sheet 61) | (Joins sheet 62)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

56

N

(Joins sheet 55)

WAYNE

BALD EAGLE MTN

LYCOMING COUNTY

Nippenose Valley

CRAWFORD

Red School

Rauchtown

Antes Creek

(Joins sheet 62) | (Joins sheet 63)

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 57

(Joins sheet 50) | (Joins sheet 51)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

58

N

(Joins sheet 51)

(Joins sheet 52)

(Joins sheet 57)

(Joins sheet 59)

BEECH CREEK

CENTRE COUNTY

Mapes

CENTRAL

BEECH CREEK

Run

Bitner

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Joins sheet 52)

(Joins sheet 53)

(Joins sheet 58)

(Joins sheet 60)

(Joins sheet 64)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

(Joins sheet 53) | (Joins sheet 54)

N

B A L D E A G L E M O U N T A I N

C A S T A N E A

B A L D E A G L E V A L L E Y

L A M A R

N I T T A N Y

Bald Eagle-Nittany School

Mill Hall

Salona

Cedar Springs

Rote

BALD EAGLE CREEK

PENNSYLVANIA CANAL

PENNSYLVANIA RAILROAD

NEW YORK CENTRAL RAILROAD

BALD EAGLE CREEK

FISHING CREEK

CLAY MINE

QUARRY

W Kammerdiner Run

Long Run

Cedar Run

(Joins sheet 59)

(Joins sheet 61)

(Joins sheet 65)

0 ½ 1 Mile

Scale 1 20 000

0 5000 Feet

(Joins sheet 54) | (Joins sheet 55)

61

(Joins sheet 66)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

62

N

(Joins sheet 55) | (Joins sheet 56)

(Joins sheet 61)

(Joins sheet 63)

(Joins sheet 67)

0 ½ 1 Mile

Scale 1 20 000

0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 63

63

N

(Joins sheet 56)

(Joins sheet 62)

(Joins sheet 68)

0 ½ 1 Mile Scale 1 20 000 0 5000 Feet

(64)

(Joins sheet 59)

N

Beech Creek

Beech Creek Station

Parvin

Abdera

BEECH CREEK MOUNTAIN

EAGLE

BALD

PORTER

NITTANY VALLEY

CENTRE COUNTY

CENTRE COUNTY

BEECH CREEK

EAGLE

PENNSYLVANIA

CENTRAL NEW YORK

LAMAR

0 ½ 1 Mile

Scale 1 20,000

0 5000 Feet

(Joins sheet 65)

(Joins sheet 69)

(Joins sheet 60)

65

N

(Joins sheet 64)

(Joins sheet 66)

(Joins sheet 69) | (Joins sheet 70)

Scale 1:20 000

(Joins sheet 61)

N

L A M A R

BIANBARES FIRE TOWER

B I G M O U N T A I N

L O G A N

G R E E N E

SUGAR VALLEY MOUNTAIN

Spruce Run

Lamb Run

Pepper Run

Cherry Run

(Joins sheet 65)

(Joins sheet 67)

(Joins sheet 70) | (Joins sheet 71)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Joins sheet 62)

(Joins sheet 66)

(Joins sheet 68)

(Joins sheet 71)

(Joins sheet 72)

N

Rosecrans

Loganton

G R E E N E

M O U N T A I N

S U G A R V A L L E Y

S U G A R V A L L E Y

McElhattan

Hopple Creek

Fishing Creek

Run

Rocky

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(68)

(Joins sheet 63)

N

(Joins sheet 67)

LYCOMING COUNTY

UNION COUNTY

CENTRE COUNTY

SUGAR VALLEY MOUNTAIN

GREENE

SUGAR VALLEY

NITTANY MOUNTAIN

Carroll

Eastville

Fishing Creek

Green Gap

EAST POINT FIRE TOWER

(Joins sheet 72) | (Joins inset, sheet 72)

0 ½ 1 Mile

Scale 1 20 000

0 5000 Feet

(Joins sheet 64)

(Joins sheet 65)

69

N

(Joins sheet 70)

(Joins sheet 73)

Scale 1 20 000

0 ½ 1 Mile

0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 70

(70)

N

(Joins sheet 65) | (Joins sheet 66)

(Joins sheet 69)

(Joins sheet 71)

PORTER MOUNTAIN

BIG MOUNTAIN

BEAR VALLEY

SUGAR VALLEY

LOGAN MOUNTAIN

Cherry Run

Bear Run

FISHING CREEK

Tylersville

Schreckengast Gap

(Joins sheet 73) | (Joins inset, sheet 73)

0 ½ 1 Mile

Scale 1: 20 000

0 5000 Feet

(Joins sheet 66) | (Joins sheet 67)

N

SUGAR VALLEY MOUNTAIN

LOGAN VALLEY

NITTANY MOUNTAIN

Schracktown

Booneville

Blue Spring

FISHING CREEK

Sugar Grove School

Logan Mills

Greenburr

Kahl Gap

Wolf Gap

Bull Run Gap

Bull Run

CENTRE COUNTY

(Joins sheet 70)

(Joins sheet 72)

(Joins inset, sheet 73)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 72

72

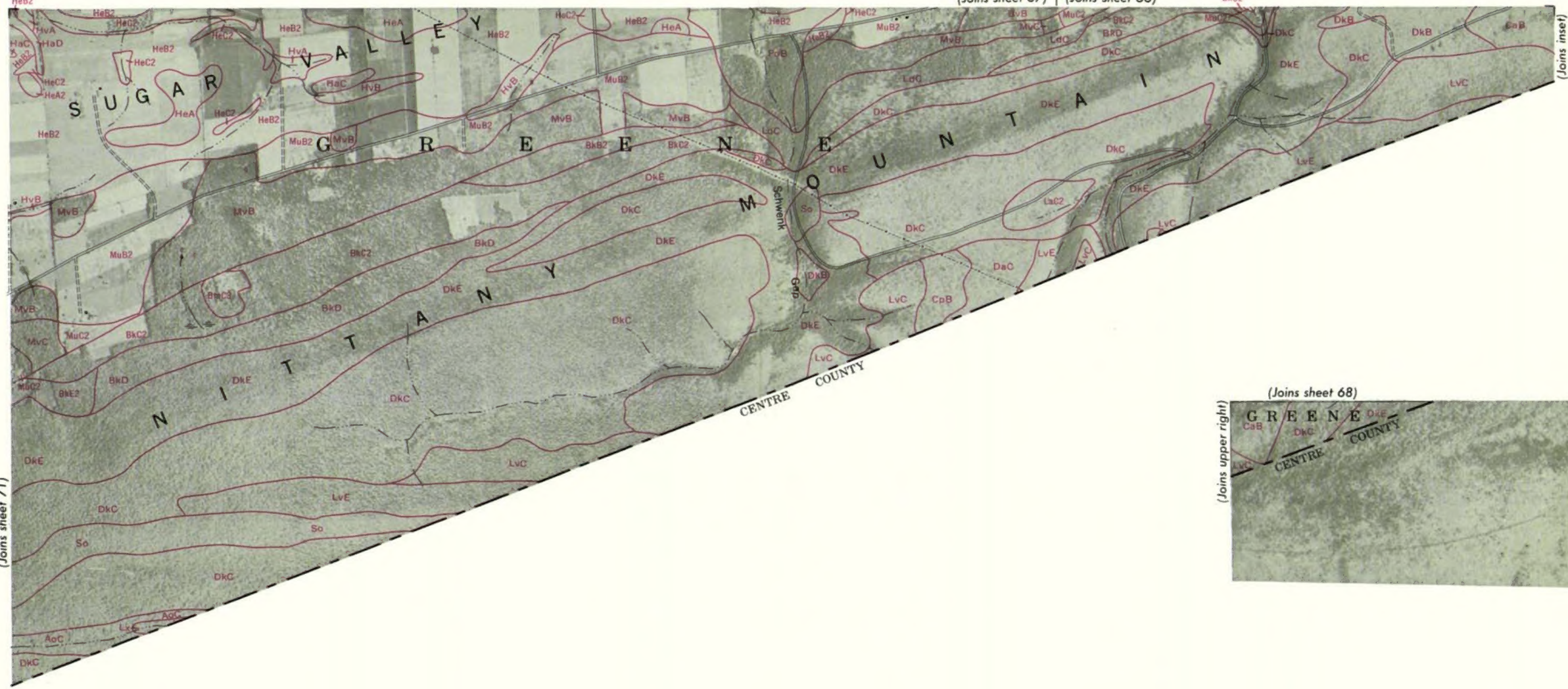
(Joins sheet 67) | (Joins sheet 68)

(Joins inset)

(Joins sheet 71)

(Joins sheet 68)

(Joins upper right)



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

CLINTON COUNTY, PENNSYLVANIA — SHEET NUMBER 73

(Joins sheet 69) | (Joins sheet 70)

73

N

(Joins inset)

P O R T E R

Chestnut Ridge

CENTRE COUNTY

Little Kettle Mountain

N I T T A N Y

CENTRE COUNTY

M O U N T A I N

Bletz Hollow

L O G A N

S U G A R V A L L E Y

FISHING CREEK

POND AREA
DEPT OF FISHERIES

Collier Gap

(Joins sheet 70) | (Joins sheet 71)

(Joins upper right)

L O G A N M O U N T A I N

Spangler Gap

N I T T A N Y

CENTRE COUNTY

Bletz Hollow

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet